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DARDELET THREADLOCK CORP., 55 Liberty Street, New York, N. Y.
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July 10, 1937

When writing to advertisers please mention *Automotive Industries*

AUTOMOTIVE INDUSTRIES

of the **AUTOMOBILE**

Reg. U. S. Pat. Off.
Published Weekly

Volume 77

Number 2

JULIAN CHASE, Directing Editor
HERBERT HOSKING, Editor
P. M. HELDT, Engineering Editor
JAMES U. STEINFIRST, News Editor
JOS. GESCHELIN, Detroit Technical Editor
GEOFFREY GRIER, Art Editor
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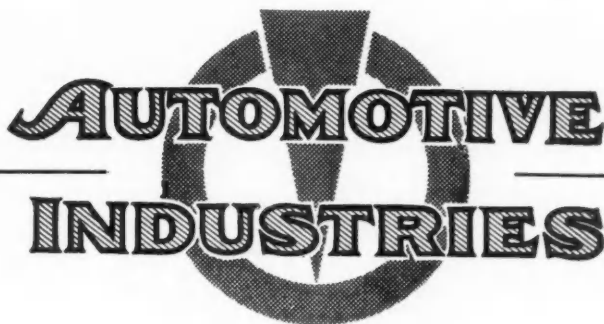
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Automotive Industries



Sub-normal Seasonal Drop Seen for June

Despite inability to meet demand for new cars, preliminary estimates indicate domestic deliveries of 372,000 passenger cars and about 61,500 trucks, or a total of 433,500 vehicles. This is a decline of 8.8 per cent from the 473,000 units delivered in May and is less than the normal seasonal drop. Subject only to seasonal influence, June sales should run slightly more than 10 per cent under the May volume. If some of the major producers had been able to carry out their production schedules last month free from labor troubles, June deliveries undoubtedly would have come close to the May volume. A number of individual producers reporting at the close of the first half of the year announced that sales trends were strong toward the end of June.

Unfilled Car Orders Still Large

Backlog Accumulated During Strikes Expected to Exert Strong Summer Influence; 1938 Models to Benefit

The backlog of orders accumulated during the strikes is keeping up the current retail business of the automobile industry and will continue to exert a sustaining influence on volume all through the summer. Some of the leading companies report that they still have good sized banks of unfilled orders on hand and are expecting both July and August to produce a satisfactory retail volume.

Factories were still crippled by strikes during the first half of June so that last month's delivery figures were again distorted by car shortages. It has been difficult to gauge the market's potential this spring because of the shortages. Lacking stocks from which to make deliveries, selling efforts were slowed down. In many instances, salesmen quit soliciting new business when they found that they could not fill orders they already had booked. A

good part of this potential business, it is felt, will be carried over to the next model year. It is not expected that the seasonal sag can be offset entirely by the backlog of orders. Sales officials look for a drop in July. Obviously, new orders are not being booked at the spring rate. The effect on demand of the advanced new model introduction date, combined with the normally slack summer demand, will begin to register in the current month's delivery figure.

AMA Reports for June

June shipments from automobile and truck factories of the United States and Canada were 525,983, an increase of 12 per cent over June, 1936, when the figure was 469,368 units, the Automobile Manufacturers Association reported. Shipments for May, 1937, were 540,357. The industry's shipments for the first six months of the year were 2,922,264, which, with the exception of the first six months of 1929, was the largest total ever reported. Shipments for the first six months of 1936 were 2,594,508. The increase was 13 per cent.

Several companies expect to wind up their 1937 production runs by the end of July or early in August. The Ford Motor Co., which closes for inventory and summer vacations July 16, will be back in production on current models Aug. 9. Other major producers expect to carry through most of the month so that August stands a good chance of showing a sizable output, since those dropping out early are not among the largest producers.

(Continued on page 47)

Ford Wages Average 90¹/₄c An Hour

29,464 Receive \$7.20 a Day, Is Report; NLRB Hearings on Union Complaints Against Company Begin in Detroit

The average daily wage of the 86,889 Ford Motor Co. factory employees in the Detroit district is \$7.26 or 90¹/₄ cents an hour, the Detroit *Free Press* reported July 8.

As of July 1, it was reported, the largest group of employees, 29,464, is paid 90 cents an hour or \$7.20 a day. The work week is five days, giving the 29,464 employees a wage of \$36 for a 40-hour week. This figure does not include the 1989 employees on the salary rolls, working in offices and on boats, or 288 college students, who are working during the summer months.

Only 5598 workers are being paid the minimum rate of 75 cents an hour, or \$6 a day. Those receiving this rate are employed as sweepers and at other unskilled jobs.

In the second largest group, 22,532 receive 85 cents an hour or \$6.80 a day, while 11,450 workers receive 95 cents an hour or \$7.60 a day. One dollar an hour is paid to 5431.

The Ford Company employs 10,000 disabled men, who were handicapped

at the time of hire. These workers, including 34 blind men, work in various factories and at odd jobs set aside for invalids.

There follows the complete tabulation of wages paid employees on factory payrolls for July 1 in the plants at the Rouge and in Highland Park, Flat Rock, Northville, Phoenix, Waterford, Plymouth, Nankin Mills, Ypsilanti,

(Turn to page 47, please)

This Week

NEWS includes a breakdown of Ford wage rates . . . Forecast that Summer and Fall automobile sales will be benefited by the backlog of orders built up during the strike . . . Announcement and details of the new GM "quiet rooms" where car noise tests are to be made . . . Story on what happened at Roosevelt Raceway.

FEATURES include a technical description of the Warner electric brake and its production . . . Report on the use of gas-producer vehicles in Italy and elsewhere . . . A new slant on the reasons why it is said that motor vehicles pay too much for the use of the highways.

Truck Ability Held Key to Safety

Engineers Agree Slow Speed on Hills a Hazard; More Power Held Needed to Maintain 20 M.P.H. on 4 Per Cent Grades

Engineers agree that a higher ability factor for trucks would result in greater highway safety since slow speeds on hills are a definite hazard, a survey by the *Commercial Car Journal* shows. A majority of those replying to questions indicated that trucks should be able to ascend 4 per cent grades at 20 m.p.h. Most of the engineers admitted that larger powerplants would be needed to achieve the designated ability factor.

Without exception the engineers replying to the query stated that slow speed on hills is a definite safety hazard. One said that poor performance means an undersized engine and that probably undersized parts of all sorts would be found on the same truck.

The ability factor of 20 m.p.h. on a 4 per cent grade met with quite general approval, but some responses indicated that tractor and six wheel equipment could well be required only to climb 2 per cent grades at 20 m.p.h. One answer said that very few large trucks, particularly of the six wheel and tractor types have sufficient power to match the suggested ability factor. Two suggested an ability factor of 20 m.p.h. speed on 3 per cent grades.

A large majority of the engineers advised "grandfather clauses" in any regulation on the subject. Varying periods were suggested with one proposing immediate effectiveness as to

new equipment, and one immediate effectiveness of a light ability factor.

Restudy of transmission and axle ratios, larger engines, or smaller loads would result from regulation covering ability factors. One answer indicated the undesirable possibility of two types of trucks, one for cities where regulation would probably not be effective, and the other for highway use. Lighter trucks might result, said one reply. One suggested that larger engines without proportionate increases in propulsion elements might be tried. First cost of equipment would rise, several replies indicated. One engineer said that only quieter transmissions would be needed to permit trucks greater power in lower gears.

Low Income Group Buys Cars

Pointing out that increased automobile buying will soon result in a total of 30,000,000 automobiles operating on the roads of this country, a number that is approximately three times the total of all other countries in the world, the American Petroleum Industries Committee estimates that during the past three years close to 3,000,000 families having annual incomes of \$1,500 a year or less have been added to the ranks of motorists in the United States. In 1934 total automobiles, including trucks, registered in this country stood at about 25,000,000. By the

end of the current year automobile registrations will stand about 5,000,000 above that figure, a remarkable expansion in automobile ownership.

The 3,000,000 families which the committee estimates have recently acquired the car-owning status are not, however, to any large extent purchasers of the new automobiles. They have bought used cars that the new cars have replaced. Used cars are broadening automobile ownership among the lower income groups at the rate of one million families annually, the committee estimates. More than 10,000,000 families in the United States owning cars have never purchased a new car.

"Dues Strike" Fails

Goodrich Local Drops Effort To Get Funds from Men

Alleged threats of the Goodrich Local United Rubber Workers Union of the CIO to picket the B. F. Goodrich plants in Akron and lock out all union members delinquent in their dues, failed to materialize July 6. There was no picketing of the factories. Apparently in anticipation of trouble, 500 Ohio National Guardsmen were rushed to Akron July 5 from Camp Perry and are quartered at the Akron Armory.

First public revelation of anticipated trouble at the Goodrich plant came July 5 when the Goodrich company carried full-page advertisements in Akron newspapers assuring all employees that their membership, or lack of membership, in any outside organization would not deprive them of their right to work.

The Goodrich advertisements quoted notices received by employees from L. L. Callahan, president of the Goodrich local, CIO, which said: "You are hereby notified that on July 6, the strike committees of the various departments will meet the different shifts going to work. Any member whose dues are delinquent shall be met at the gate by said committee and not allowed to enter plant unless he is a member in good standing.

"This is in compliance with action taken at our regular meeting June 20. Please confer with your department committee."

Goodrich officials in their paid messages made the following statement:

"Quite a while ago, Goodrich stated that . . . 'lack of membership in an outside organization would never deprive a Goodrich employee of the right to work at Goodrich. That policy still stands.'

"The position of the Goodrich company with respect to these policies remains unchanged. While the matter of payment, or non-payment of dues is a question for determination solely by employees themselves, nevertheless in view of the instructions issued as above set forth, the management of the company believes it necessary to request the proper authorities to take whatever action may be required in order to make certain that the normal operations of

Passenger Car Production by Wholesale Price Classes

(U. S. and Canada)
Five Months 1937 and 1936 Compared

	1937	1936	Per Cent Change	Per Cent of Total	
				1937	1936
Under \$500.....	965,442	941,756	+ 2.3	49.38	54.18
\$501-\$750.....	901,349	704,297	+28.0	46.10	40.52
\$751-\$1000.....	63,841	64,769	- 1.5	3.27	3.73
\$1001-\$1500.....	16,573	20,396	-19.0	.85	1.17
\$1501-\$2000.....	6,171	4,586	+34.5	.31	.26
\$2001-\$3000.....	1,721	2,251	-23.5	.09	.13
\$3001 and over.....	111	189	-41.2	.00	.01
Total.....	1,955,208	1,738,244	+12.6	100.00	100.00

Truck Production by Capacities

(U. S. and Canada)
Five Months 1937 and 1936 Compared

	1937	1936	Per Cent Change	Per Cent of Total	
				1937	1936
1½ Tons and less.....	415,162	363,667	+14.0	94.13	94.00
2 to 3 Tons.....	16,427	15,690	+ 4.8	3.72	4.05
3½ Tons and over.....	4,944	3,323	+48.6	1.12	.86
Special and buses.....	4,540	4,216	+ 7.7	1.03	1.09
Total.....	441,073	386,896	+14.0	100.00	100.00

the Goodrich plants will continue, and that employees scheduled to report for work on July 6, or on any other normal work day, may enter and leave the Goodrich plants without interference."

Following the publication of the Goodrich message, Callahan stated, "The notices were just a stiff jolt to remind some members that they should bear their share of the load." The union claims 12,000 Goodrich members. The dues are \$1 per month.

Airports on Increase

There were 2361 airports and landing fields in the United States on July 1, 1937, the Bureau of Air Commerce announced. Of these 703 were partially or fully lighted for night use.

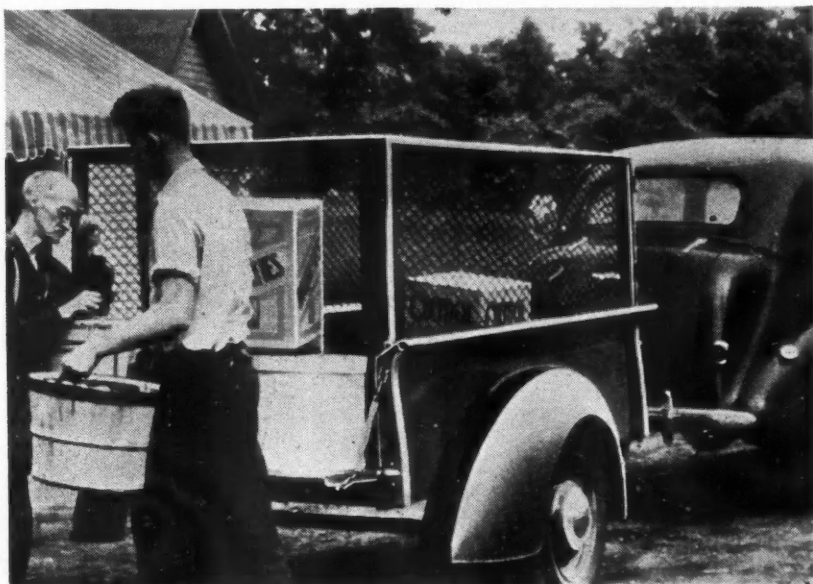
On January 1, 1937, there were 2342 airports and landing fields.

Six states had 100 or more airports and landing fields each on July 1, 1937: California, 186; Texas, 131; Michigan, 123; Florida, 120; Pennsylvania, 111; Ohio, 106.

GMC Announces New Trailer

A new General Motors Truck product has been announced. It is the "Trailabout," a two wheeled trailer which hitches to passenger cars or trucks and has a capacity of 1000 lb. Production is already under way, stated J. P. Little, vice-president of the truck division.

There are two body lengths, 77 in. and 91 in., and four body arrangements including pick-up, stake and screen types. Six-inch tires, full skirted fenders, license bracket and electric tail lamp are standard equipment. A ball and socket hitch which can be locked is provided. The trailer comes with or without springs and has a folding leg to maintain a horizontal position when detached. Optional features include side steps and an automatic rear step which moves into place when the rear tail gate is lowered.



"TRILABOUT" is the name of this new GMC two-wheeled unit with 1000 lb. capacity. It comes in

two sizes with four body arrangements, and with or without springs. Production is under way. It has a locking hitch.

Plant Accident Figures Drop

Safety Council Reports Improvement Over 1935 and Lower Rates in Automobile Factories Than Others

Plant accidents in the automobile industry declined sharply in 1936 from the preceding year, according to a report by the National Safety Council, Inc. The frequency and severity of accidents in the automobile industry was below the averages for other industries.

Frequency of plant accidents in the automobile industry in 1936 was 10.96, according to reports from 60 organizations whose employees worked 538,560,000 man-hours during the year. Severity index was .89. The 1936 frequency rate was 23 per cent under the 1935 figure and the severity rate was 11 per cent under 1935. The 1936 rates compared with a 13.57 frequency rate for all industries, and with a 1.64 severity index. The reductions in the automobile industry from 1935 compared with a frequency reduction of 1 per cent and a severity decline of 5 per cent by all industries.

Large plants made the best 1936 records, averaging 11.28 for frequency and .97 for severity. Small plants had the worst 1936 records and failed to equal gains in large ones. Accidents were fewer in automobile manufacture and assembly plants, averaging 10.62 for frequency and .81 for severity.

Plants manufacturing stampings reported the largest cut in accident frequency, 30 per cent, and automobile manufacturing assembly plants reported the greatest improvement in severity, 23 per cent.

The most important mechanical cause in a compilation of data on 32 fatalities and permanent partial disabilities in

the past three years was "improper guarding" and the chief personal cause was "lack of knowledge or skill." The most important type of compensable accident is "handling objects" which accounts for 23.2 per cent of all types of accidents in automobile plants.

As in 1935, automobile body plants had the highest frequency rate, 23.66, followed by automobile parts plants with 19.36. The only division to report a poorer severity rate was automobile stampings which reported a 106 per cent increase although frequency was cut 30 per cent.

The council's honor roll for 1936 shows that among automobile plants the Plymouth Motor Corp. had the lowest frequency rate among large plants, 2.13, and the lowest severity rate .32. Dodge Bros. reported the largest improvement since 1934, 46 per cent in frequency and 53 per cent in severity.

In the automobile stampings division, Ternstedt Mfg. Co. had the lowest frequency rate among the large plants, 1.11. McCord Radiator and Mfg. Co. (Detroit) had the lowest severity rate among the large plants, .10, and the largest reductions in frequency and severity since 1934, 66 and 97 per cent. The same company (Wyandotte, Mich., plant) had the lowest frequency rate among smaller plants, 16.55. The press division of Murray Corp. of America, Plant No. 1, had the lowest severity rate among small units, 1.05, and the largest reductions in frequency and severity since 1934, 50 and 52 per cent.

In the automobile parts and accessories group, Chrysler Motor Parts Corp. had the lowest frequency rate of the large units, 4.90, and the greatest reductions in frequency and severity since 1934, 47 and 67 per cent. The Benton Bailey Co. had the best 1936 record of the small plants, 66,000 man-hours without a disabling injury and the largest reduction in both rates since 1934, 100 per cent.

Hudson Has Peak Month

Hudson Motor Car Company's June output and six months shipments were the largest in seven years. The company in June shipped 16,700 cars, a gain of 49 per cent over June, 1936 and 9 per cent over May, 1937. June shipments were the largest for any month since April, 1934. Despite the fact that Hudson's production was interrupted for a 5-week period during March and April, production for the first half of the year exceeded output for first half of 1936, shipments totaling 68,277 cars against 67,615.

Liquidating Business

Receivers appointed for the Quaker Trailer Co. of Devon, Pa., are engaged in the liquidation of the business, according to R. J. Erle of the Northwestern National Bank in Philadelphia, one of the receivers. The other is E. C. Schmidheiser, lawyer. The receivers expect to be able to meet all obligations.

German Wins Vanderbilt Race

Rosemeyer in Auto Union Averages 82.564 M.P.H. for 300 Mile Run; Seaman Second, Mays Third; Nuvolari Breaks Down

Fifty-one and three hundredths seconds marked the difference between the winner and the runner-up in the 300-mile Vanderbilt Cup Race at Roosevelt Raceway, Westbury, Long Island, N. Y., on July 5. Bernd Rosemeyer of Germany, driving an Auto Union, won with an average speed of 82.564 m.p.h. Richard Seaman, English driver, representing the German Mercedes-Benz team, was second with an average of 82.243 m.p.h. Rex Mays of Glendale, Calif., was the first American driver to finish. He crossed the line in his rebuilt Italian Alfa Romeo with an average of 80.144 m.p.h.

It was the second major race of the season to result in a seconds-apart finish as the Indianapolis Silver Anniversary race on Memorial Day was won by Wilbur Shaw in a Shaw-Gilmore Special by only 2.16 seconds. Shaw finished ninth at Roosevelt Raceway, driving a Maserati. Last year's Vanderbilt race winner, Tazio Nuvolari of Italy, in an Alfa Romeo, was forced out by engine trouble in the seventeenth lap. He later drove as relief for Dr. Giuseppe Farina, Italy, also of the Alfa Romeo group.

Seaman would have come closer to Rosemeyer's time had he not stopped for gasoline in the eighty-ninth lap of the 90-lap race. The stop cost him the difference between his position about 10 seconds back of Rosemeyer and his finishing position 51 seconds behind.

The race was held on the rain date instead of the originally planned July 3. The management called off the race on July 3 when sudden rain soaked the track. There were 35,000 in the stands on July 3 and 75,000 on July 5.

Billy Winn of Detroit in a Miller Special was well up with the leaders when a broken drive shaft put him out in the ninth lap. He had been having a

series of brushes with Seaman, losing on the straightaways to the more powerful German car, but repassing Seaman on the curves.

Stretch speeds ranged as high as 159 m.p.h. There were no accidents.

Rosemeyer's 16 cyl. rear engined car made only one pit stop at the thirty-eighth lap. There, in 35 seconds, the crew refueled the car and changed two tires.

The race proved another point beyond all question, and that is that the American drivers, given automobiles comparable in performance with those brought over by the visiting drivers, can hold their own with the best of them. No less spectacular than the driving of Rosemeyer was the performance turned in by Rex Mays, who caused the leaders no end of trouble. His magnificent handling of his slower Alfa Romeo, particularly on the turns, won him the cheers of the crowd and made him a constant threat to Rosemeyer and Seaman.

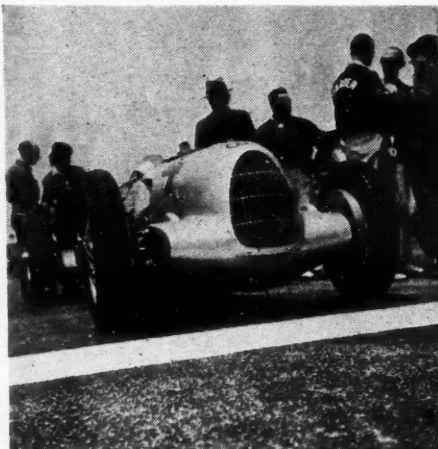
The foreign drivers will carry away with them an added store of knowledge about racing. The dirt track experience of the American drivers stood them in good stead when it came to rounding

the turns, and the gentlemen from Europe were quick to adopt the practice of hitting the turn fast and letting the rear of the car slide around so that the driver could come out of the turn with the nose of the car pointed toward the pole position. Taking the banked turn high, and then driving down into the straightaway utilizing the grade of the bank to give added acceleration was another point they were quick to copy.

Early in the race, Wilbur Shaw's exhaust pipe broke loose from the exhaust manifold, and all efforts of his pit crew to repair the damage were unsuccessful, and he was forced to drive practically the entire distance with the straight exhaust pouring out of the manifold less than three feet from the cockpit. An interesting side-light on this condition was the decision of the technical committee. The rules state that the car must be fitted with a manifold and an exhaust pipe, and that the exhaust pipe must extend to the rear of the rear axle; in the event of the loss of either the exhaust pipe or the manifold, the car must immediately come in to the pit for a replacement of these parts. But in Shaw's case neither of these parts was lost—the connection between the two was simply destroyed, and although he was flagged in for an inspection, during which the exhaust pipe was wired securely in place so that it could not drop off, it

Failed to Finish

Car	Driver	Cause of Withdrawal
Maserati	Mauri Rose	Broken axle shaft.
Boyle Products	Jimmy Snyder	Broken transmission shifter fork.
Hartz-Miller	Ted Horn	Motor loose in frame, and transmission locked.
Alfa Romeo	Tazio Nuvolari	Fire in carburetor.
Miller	Billy Winn	Broken driveshaft.
Mercedes	Caracciola	Engine trouble—brake failure.
Alfa Romeo	E. Bjornstad	Clutch burned out.
Marks-Miller	Geo. Connor	Broken transmission.
Debaets	Harry Lewis	Lost magneto coupling.
Maserati	Babe Stapp	Broken piston.
Miller	Kelly Petillo	Rear axle locked.
Schumacher	Al. Cusick	Broken rear wheel hub.
Duray	R. Householder	Broken oil line.
Kimmel	Henry Banks	Lost rear axle shaft nut.
Ambler	Gus Zarka	Broken connecting rod.
Ambler	Ora Bean	Flywheel bolts sheared off.



WINNER of the Vanderbilt Cup Race at Roosevelt Raceway, Westbury, Long Island, N. Y., is shown at the left. It is a rear-engined 16 cyl. German Auto Union driven by Bernd Rosemeyer. In the center is a view of the

engine. To the right is one of the front brakes with the air scoop for cooling clearly shown. The car made up to 159 m.p.h. on the straightaways and averaged 82.564 m.p.h. on the sharply curving track.

was decided that there was no violation of the rules and he was permitted to continue.

A recheck of the first 10 to finish revealed that Wild Bill Cummings placed seventh instead of ninth, as was originally reported. He drove a Burd Piston Ring Special at an average of 74.103 m.p.h. It was the first American car to finish. This moved Russell Snowberger, in a Burd Piston Ring Special, into eighth position and Wilbur Shaw to ninth.

Labor Turnover Trend Mixed

An irregular trend in labor turnover rates was reported in the automobile industry in May compared with April, according to the Bureau of Labor Statistics. Quit rates were lower.

The bureau reported that in the classification "automobiles and bodies" the May quit rate was 1.41 per 100 employees, against 1.59 in April and 1.58 in May last year. The discharge rate was .17 against .18 in April and .29 a year ago. The lay-off rate was 1.81 against 1.58 in April and 2.06 a year earlier. Total separation rate was 3.39 against 3.35 in April and 3.93 in May, 1936. The accession rate was 3.09 against 7.63 in April and 3.84 a year ago.

In the automobile parts field, the quit rate was 1.92 against 3.07 in April and 1.76 in May, 1936. Discharge rate was .35 against .42 and .42 a year ago. The lay-off rate was 2.92 against 4.04 in April and 2.91 a year ago. Total separation rate dropped to 5.19 from 7.53 in April, against 5.09 in May last year. Accession rate also was sharply lower at 5.53 against 9.93 in April, and against 5.12 a year ago.

The National Industrial Conference Board reported that in April employment in the automobile industry was 6.3 per cent above that for 1929 while there was a 9.4 per cent drop in the length of the working week.

SILENCE has been achieved by General Motors inside the laboratory shown at the right. There car noise will be searched out and eliminated.



Automotive Industries

GM Opens New Acoustical "Lab"

Completely Soundproofed Building Provided at Proving Ground for Car Noise Elimination Program

A new acoustical laboratory for the detection and elimination of sound in automobiles was placed at the disposal of Chevrolet engineers at the General Motors proving ground this week. Later, it will be used by other G. M. divisions. The laboratory, said to be the most completely-equipped building of its kind in the world, will provide the engineers with greater facilities than they have ever before possessed, officials declared.

Enclosed within the buildings are two specially-built sound-proof rooms, each with its separate walls, ceiling, and floor to shut out outside noises. Sounds initiated in these and other testing rooms are recorded on instruments set up in a central control room, which has 48 separate circuits connecting it with various outlets in the five testing rooms in the building.

An unusual construction has been employed in the "silent rooms," in one of which the air is so still that the silence is oppressive. The floor is built on a six-inch concrete base, which is topped by a layer of heavy felt "chairs" over which a three-inch layer of concrete has been laid. On top of that comes a layer of rock wool, a two-inch air space, another layer of rock wool, and a covering of transite.

The ceiling and walls are separated from the rest of the building by a six-inch air space. Successively, they include a six-inch layer of concrete, two-inch air space, two-inch layer of compressed rock wool, two-inch air space, two-inch layer of loose rock wool, and a covering of transite.

One of the "silent rooms" is built to admit an automobile for body, chassis, and engine acoustics tests, while the other will be used principally for parts

testing. A third insulated room contains an engine dynamometer and apparatus for operating the chassis dynamometer tests.

A special overhead treadmill has been built into the ceiling of another room in order to eliminate vibration during chassis dynamometer testing. The car is raised to roof level on a special hoist and run onto the wheels of the treadmill on the roof of the building. A specially constructed portable recording machine measures the required data in the room below.

The new laboratory will be under the direction of A. J. Schamehorn, proving ground director, and E. E. Wilson, engineer in charge of the acoustical division. P. A. Collins, Chevrolet engineer in charge of experimental work, will supervise all Chevrolet work at the new laboratory.

Specialties Expanding

United Company Adds Alco Valve; To Consolidate

United Specialties Co. announced plans for the acquisition of the Alco Valve Co., manufacturers of expansion valves used in refrigerators, it was announced by Christian Girl, president of the former company. United Specialties was recently formed as a holding company to control United Air Cleaner Co., Chicago, and Mitchell Specialty Co., Philadelphia.

United Specialties is expected in the near future to announce the acquisition of one or more other companies in the specialty field. It will also take steps to alter its status as a holding company to that of operating company with divisions.

Financing to provide funds for the \$500,000 purchase and for additional working capital will be provided by the sale to present stockholders and others through Russell, Maguire & Co., New York, of 25,000 shares of \$1.40 cumulative convertible preferred stock of no par value at \$25 a share. The new preferred would be convertible up to Aug. 1, 1938, into 1½ shares of common stock, up to Aug. 1, 1939, into 1¼ shares of common stock, and thereafter into one share of common stock.

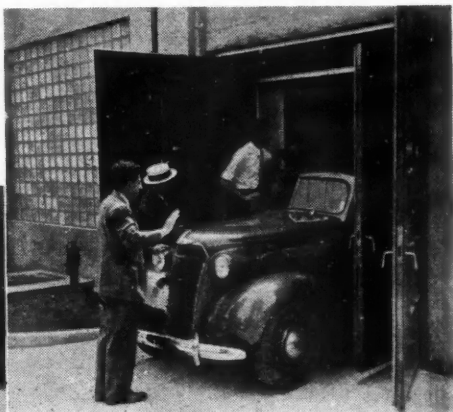
United Specialties is purchasing 80,000 of the 100,000 outstanding shares of Alco Valve from Russell, Maguire & Co. for \$500,000 plus interest at 5½ per cent from date of agreement.

Michigan Sales Tax

By a ruling of the state board of tax administration of Michigan, effective July 1, buyers of automobiles are exempt from the 3 per cent sales tax to the extent of the value of the used car traded in. Heretofore the car buyer was liable for the tax on the full purchase price of the new car with no credit for the used car turned in.

MEASURING

noise developed by a car in the "quiet rooms." Some of the construction materials employed are shown at the left.



Business in Brief

Written by the Guaranty Trust Co., New York

Strikes and seasonal factors have not prevented business activity as a whole from being well maintained. The weekly index of the New York *Journal of Commerce* stood at 101.6 last week, as against 101.1 a week earlier and 92.3 a year ago. Dun & Bradstreet's estimates indicate that retail trade was about 3 to 6 per cent larger than in the preceding week and 10 to 20 per cent above the level a year ago, while wholesale trade is estimated at 12 to 25 per cent larger than in the corresponding period last year.

Carloadings Rise

The seasonal increase in railway freight traffic has continued. Loadings in the week ended June 26 totaled 773,733 cars, showing an increase of 17,444 cars, or 2.3 per cent, above the total for the preceding week, and a gain of 60,145 cars, or 8.4 per cent, above that for the corresponding period last year. The Shippers' Regional Advisory Boards estimate that loadings in the third quarter of the year will be about 7.9 per cent greater than actual loadings in the similar period of 1936.

Production of electricity by the electric light and power industry of the United States for the week ended June 26 was 11.6 per cent above the total for the corresponding period last year. This compares with a gain of 11.3 per cent reported a week ago and one of 13.8 per cent two weeks ago.

Average daily crude oil production for

the week ended June 26 amounted to 3,529,600 barrels, showing an increase of 18,650 barrels above the figure for the preceding week and remaining above the level of 3,366,000 barrels calculated to be the total of the restriction imposed by the oil-producing states for June. Production a year ago averaged 2,969,150 barrels daily.

The lumber industry during the week ended June 19 stood at 82 per cent of the 1929 weekly average of production and at 71 per cent of 1929 shipments. Production was nearly equal to that in the preceding week, which was the largest so far this year except for three weeks in May.

Fisher Index Stronger

Professor Fisher's index of wholesale commodity prices for last week stands at 92.5 per cent of the 1926 average, as against 92.0 a week earlier and 91.9 two weeks earlier. The current figure is the highest since the first week in June but is lower than the averages for March, April and May.

Bills discounted by the Federal Reserve banks decreased \$3,000,000 during the week ended June 30, but this decline was offset by an increase of an equal amount in other Reserve bank credit. The gold stock increased \$48,000,000, member bank reserves \$46,000,000, money in circulation \$54,000,000, and Treasury cash \$49,000,000, while Treasury deposits with the Federal Reserve banks declined \$58,000,000.

are devoted to general information and include: a business law section; tables of weights, measure, and capacity; workshop formulas and construction data; business and banking tables; and Waverly formulas.

"Trailer Engineering" (Passenger-Car Trailers), second edition, by Ray F. Kuns. Published by the author at Madisonville, Cincinnati, Ohio.

This is a book intended for the trailer enthusiast, whether he be inclined to build his own trailer or to buy one. It outlines the development of the trailer movement, divides trailers into nine classes which are illustrated by diagrams, gives general rules for the design of trailers and instructions on the construction and furnishing of house trailers. A number of designs are described in detail, with working drawings. There are also chapters on State regulations applying to trailers, to trailer brakes, and to "ironing" the tow car, which is the term used for providing the tow car with a suitable coupling.

New Graham Tractor Ready

The new tractor to be built by Graham-Paige Motors Corp. for Sears, Roebuck & Co., will be introduced July 13. In celebration of the event, Sears is joining with the Grahams in a party and elaborate pageant at the Graham Farms near Washington, Ind., to which are invited prominent educators in agriculture and editors of farm and trade publications. The first tractor was scheduled to come off the production line this week and plans call for the building of 250 units in July.

... slants

THERE, TOO—It seems inevitable that car prices will rise this year, reports "The Autocar," of London, commenting on a shortage of raw materials and higher cost of labor, which, it says, were caused primarily by the rearmament program. The cause is not obviously operative here. "The Autocar," it appears, is also interested in what happened 40 years ago, for it carries an extract from its pages of that time. In defining the motor car then it asserted that "a motor car of today, as made by our leading companies, can compete with the horse, not only in speed, but also in economy of keep and attendance."

PARK POLICE—Elimination of traffic snarls in Yellowstone Park will be one of the major tasks of a new fleet of police patrol cars just installed there. They will also enforce speed limits. Each car carries first-aid equipment, tow ropes and fire fighting apparatus.

TWO OF THEM—New Jersey now has two automobile drivers who have never had accidents in 1,000,000 miles of driv-

Books

of automotive interest

"The Ford V-8 Cars and Trucks," by Victor W. Page. Published by the Norman W. Henley Publishing Co., New York.

A new instruction book on Ford V-8 cars and trucks, models 1932 to 1937 inclusive, written in non-technical language for owners and repairmen.

Short-cuts for repairing all parts are explained, and tools and fixtures especially designed to facilitate service work are described in detail. Construction and operation of the important parts of the chassis are covered comprehensively by text and many illustrations.

Among the many topics on which practical suggestions are given are included: trouble shooting on the road and in the shop, driving and upkeep, power plant overhauling, locating defects in carburetion, cooling and ignition systems, and lubricating instructions.

"Chevall Accessory Blue Book." Compiled and published by the Chek-Chart Corp., Chicago, Ill.

First edition of a handy manual to be published annually. It contains dimensional specifications of essential emergency accessories for virtually all passenger automobiles in general use.

Essential accessories are defined by

the editors as parts not ordinarily made by the car manufacturer and which "are essential to the operation of a motor vehicle, require periodic replacement, and differ in individual models only in detail dimensions rather than general design."

Only those accessories within this classification are covered in the data given and include spark plugs, fan belts, radiator hose, oil filters, and any replaceable parts that may be conveniently stocked and installed by the average service station.

Suggestions are given in the manual for accessory display and merchandising. Other material includes a business booster page, an anti-freeze proportion table and detailed instructions for installing essential accessories.

"The Waverly Handbook." Compiled and edited by S. G. Symons. Published by the Waverly Oil Works Co., Pittsburgh, Pa.

The ninth edition of this work in which the scope of material covered has been greatly extended and much new data of practical value to engineers in the petroleum industry added.

Tabular data and descriptive material is presented under the following subject headings: lubricating oil; Pennsylvania motor oil; animal and vegetable oils; fuel oil; crude oil production; gasoline; secondary recovery methods; automotive lubrication; benzol; A.S.T.M. standards; oil and gasoline meters; and fire underwriters regulations.

Several chapters of the new edition

ing. The state's Safe Drivers Committee announced that C. A. de Goll of Elizabeth has covered that distance since 1906 without ever causing an accident, although on two occasions other drivers ran into him, resulting in minor damages. H. B. Haines of Paterson has the best record in the state.

YOU TAKE YOUR CHOICE—Permutations and combinations will produce the answer that there are over 1,000,000 different Pontiac automobile models that may be ordered from the 1937 line. The company makes cars on two chassis, offers them in 15 body types in seven colors with two styles of trim, supplies four kinds of tires, two types of radiators, two types of air cleaners, three rear axle ratios and 10 different accessories. There are 81 combinations of the accessories alone.



The Timken Roller Bearing Co. has enlarged its "Engineering Journal" and has included in the conveyor section of the revised edition data on other forms of transfer equipment. The 1937 edition includes suggested layouts for the use of bearings and tubes in many types of conveyors. Data tables are included.*

The Machinery and Allied Products Institute, Chicago, has published a booklet, entitled "Capital Goods and American Progress."*

A bulletin No. 10 on rod straightening and shear equipment has been issued by the American Foundry Equipment Co., Mishawaka, Ind.*

"Fine Steels" is the title of a booklet of description and use data published by the Ludlum Steel Co., Watervliet, N. Y. It contains 142 pages.*

The Carpenter Steel Co. has published a book entitled "Tool Steel Simplified." Inquiries should be addressed to Department 12E.

Information on fans and air impellers is contained in a bulletin by the Torrington Manufacturing Co.*

An illustrated booklet by the General Electric Co., "Greater Lighting Efficiency," has been issued and is numbered 520. Additional information is given in an engineering data section.*

Neoprene, a du Pont rubber-like product, is described in a new handbook by E. I. du Pont de Nemours & Co. Applications are detailed.*

* Obtainable from editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia.

MEMA Index in Small Gain

May index of the Motor and Equipment Manufacturers Association rose to 181 per cent of the January, 1925, base, against 178 per cent in April and 150 per cent for May, 1936.

Original equipment factory shipments to motor vehicle manufacturers stood at 202 against 199 in April and against 150 in May, 1936. Accessories

Automotive Metal Markets

Demand and Operations Held About Seasonally Normal; Automobile Company Buying to Resume in a Week

Demand for steel and the rate at which finishing mills are operating are both much more in line with what is generally considered normal for this time of the year than would seem the case when the influence of strike developments is unduly magnified.

So far as steel buying by automotive consumers is concerned, the labor troubles of the steel industry have come to be a rather remote consideration. The usual lull between the finishing of current model assemblies and intensive production of new model parts is the paramount factor in the prevailing abeyance of fresh commitments of the representative sort. Some of the steel makers, following the usual line of reasoning under such conditions, jump to the conclusion that automobile manufacturers and certain parts makers have carried much heavier stocks of steel than had been generally thought. General however, is the expectation that greatly quickened demand will make itself felt by the end of next week. Here and there, steel mills also have confronting them the problem of overhauling some of the equipment that has been in continuous operation without the benefit of long overdue reconditioning.

Statistical influences divide the limelight in the non-ferrous metals markets with the continuing crop of war scares that have daily repercussions in London. Copper producers booked last

month orders for 35,395 tons of electrolytic, of which 26,687 tons were for September delivery. Producers say that their bookings for July and August deliveries this year run very close to their scheduled output for these months. A decrease of 430 tons in the world's visible tin supply, when the trade had been expecting an increase of from 500 to 1000 tons, furnished the principal bullish incentive to that market. Besides, rumors are afloat that smelter output will run considerably below the quota for July.

Pig Iron—With castings for 1937 models virtually out of the way, automotive foundries are calling for little in the way of pig iron shipments. Nor do they appear to be in any hurry to cover their third quarter requirements.

Aluminum—A Washington rumor that a reduction in the price of aluminum may result from the furnishing of electrical power to the producers by TVA at a relatively low rate, finds little credence in the market. While power is a highly important factor in the cost of aluminum production, the one cent per pound advance in the price, that went into effect four months ago, was attributed to increased labor costs. The undertone of the market for secondary aluminum is a shade stronger.

Copper—The export price climbed on Tuesday to 14½ cents, imparting a somewhat stronger undertone to the home market, which ruled steady at 14 cents for electrolytic.

Tin—Sharply higher cables greeted the New York tin trade at the resumption of business following the Fourth of July holiday. Spot Straits was quoted within a range of from 59 @ 59½ cents, denoting an advance of around 1½ cents from the previous close.

shipments to wholesalers went to 103 from 92 in April, compared with 110 in May last year. Declines were recorded in service parts shipments to wholesalers, which dropped from 155 in April to 152 in May, against 130 a year ago. Service equipment shipments to wholesalers fell from 160 to 157, compared with 113 in May, 1936.

"Facts and Figures" Is Issued

Several new features appear in the 1937 edition of "Automobile Facts and Figures," published by the Automobile Manufacturers Association, together with the usual annual compilations brought up to date to include 1936 results.

A new chart of "Factory Sales by Chrysler" appears, covering both cars and trucks. A new chart of taxes per vehicle, showing an increase for every year since 1928, is included. A report on 1936 house trailer factory sales is published.

The efforts of the automotive industry toward stabilizing its employment are pictured in graphic form. Employment in 1936 gained 3 per cent over 1929 and stabilization resulted in more work and higher annual earnings.

Considerable space is given to safety drives during the year.

The title page reports that new high levels were reached by the motor industry during 1936 and the first four months of 1937. It states that highway transportation, measured by motor vehicles in use and gasoline consumption, surpassed all previous peaks. Retail sales of passenger cars and trucks established new peaks for the first four months of any year in 1937.

40 Years Ago

with the ancestors of
AUTOMOTIVE INDUSTRIES

"New Gas Engine of Wonderful Economy"

From Munich, Germany, comes a report of a marvelous new gas engine invented by an engineer named Rudolph Diesel, and capable of turning into energy 28 to 30 per cent of the heat generated by combustion. The air is compressed to 45 atmospheres, the gas is superheated and the petroleum injected into it.

In this manner an engine of unheard-of economy of fuel is said to be produced.

No less a person than Krupp, the great gun maker of Essen, is interested in the patents.

From *The Horseless Age*, July, 1897.

Plant Notes

Plans for a \$500,000 expansion of the Ford tidewater branch assembly plant at Norfolk, Va., were announced July 7. The expansion will permit employment at peak of some 250 more workers and increase plant capacity by 50 cars daily to 400 cars daily, the announcement said.

It will also provide facilities for handling parts and other material shipped from the Ford Rouge plant here, for use in assembly into Ford V-8 cars and trucks. The parts will be shipped in Ford vessels via the Great Lakes, New York State Barge Canal, Hudson River and Atlantic coastal waters. The plant extension will be 520 feet long and 300 feet wide. Included in the program will be a 400-foot concrete dock, extending into the Elizabeth River.

General Motors Corp. will build an eastern service plant near Cranford, N. J., located on the main line of the Lehigh Valley Railroad, it was announced by Wallace Whittaker, general manager of the Inland manufacturing division of the corporation. The new plant will be the sixth GM unit in New Jersey. It will be a branch of the Inland operation at Dayton, Ohio. It will stock parts for shipment to eastern car assembly plants.

The Syracuse, N. Y., plant of the former H. H. Franklin Manufacturing Co., makers of Franklin automobiles, has been bid in at public auction by the Carrier Corp. The plant was taken over by the city.

First prize for the best use of glass in industrial buildings during the past year has just been awarded to Albert Kahn, Inc., of Detroit, for the design of the press plant building of the new De Soto automobile factory. The De Soto press plant was designed with great simplicity to give the greatest amount of efficiency in layout positions for presses, stamping machines, unloading platforms, etc. At the same time care was taken to provide daylight conditions for workmen. Total glass area is 52 per cent of walls and ceilings.

Vincent Bendix, president of the Bendix Aviation Corp., has announced the awarding of contracts for the immediate construction of 10 buildings at Aviation City, Bendix, N. J., where eastern aeronautical activities will be centralized for the corporation.

Increased demand for solvent degreasing equipment brought about by the modernization and general expansion of metal fabricating and finishing plants and the addition of many new customers has forced the Detroit Rex Products Co. to seek larger manufacturing facilities for the second time within a year. The new modern factory building to be erected adjacent to the main office building will be a 100 by 300 ft., single story, monitor type design with a two story front containing engineering offices, drafting rooms and a research laboratory.

Company Earnings

Firestone Tire & Rubber			
6 mos. ended April 30			
	1937	1936	
Net income	\$3,766,006	\$2,754,675	
Per share	1.23	70c	
Continental Motors			
quarter ended April 30			
Net income B U....	\$71,031	
Caterpillar Tractor			
5 mos. ended May 31			
Net sales	\$31,242,932	\$22,864,178	
Net income	5,093,825	3,673,469	
Divco-Twin Truck			
5 mos. ended March 31			
Net income	33,422	
Per share	15¢	
Isotta Fraschini			
Net income	7,208,000 lira	5,124,000 lira	
	(\$379,140)	(\$269,522)	
Bender Body			
4 mos. ended April 30			
Net income	\$42,330	
Per share	34¢	
B before Fed. income taxes.			
U Unfilled orders May 1, \$2,681,000.			
LeBlond Schacht Truck			
	1936	1935	
	Year		
Net sales	\$659,021	\$420,710	
Net loss	95,539	110,495	

Campbell's "Bluebird" Ready

Sir Malcolm Campbell's new single step hydroplane, Bluebird, is ready for trial runs.

Bluebird, powered with the same Schneider Trophy-type engine used in Campbell's famous racing cars, has the lightest weight per hp. ratio of any unlimited speed craft ever built. The engine will develop 2350 hp. and the total weight of the boat is around 4950 lb. Gar Wood's Miss America X, the 124.86 m.p.h. record holder, turns up 6400 hp. with her four engines, but weighs eight tons.

Sir Malcolm's new boat was designed by Fred Cooper, the naval architect who also turned out the plans for Lord Wakefield's Miss England III, which reached a top speed of 119.81 m.p.h. Miss England III was powered with two Schneider Trophy engines developing a total of 4400 hp. The boat weighed 10,500 lb.

Bluebird is 23 ft. long and has a beam of 9 ft. 6 in. Her hull is built of double-skin mahogany and streamlining is carried out by a cigar-shaped metal engine cover which extends from the steering cockpit to three feet beyond the stern. The motor is placed aft, with the shaft carried forward to a vee-drive gear box, and thence back to the single, 12-in. two-bladed propeller which turns up 9000 r.p.m. The cockpit has room for only the driver and is equipped with both hand and foot throttles. Nearly 35,000 ping pong balls are stowed under the fore deck, giving a buoyancy of one ton.

Fair Probe Promised

Withrow Says the Charges Must Prove Factual

Automobile manufacturers need not fear an investigation into trade practices that have grown out of intensive competition, if the charges of inequitable conditions have no support in factual data, Congressman Gardner R. Withrow, of Wisconsin, will say in part in a signed article to be published in the official bulletin of the National Automobile Dealers Association next week.

"When I was requested by the legislature of my state, Wisconsin, to introduce a resolution, No. 389, in the Congress to direct the Federal Trade Commission to investigate what seems to be an inequitable condition in the automotive industry and trade, I was well aware of the causes behind that request," the article will assert. "In Wisconsin we have been trying to correct that situation for two years.

"I take this stand: 'If these charges are unsound, if they have no support in factual data, then I firmly believe the automobile manufacturers, or the dealers, need not fear for one moment the resolution which I have introduced.

"I am convinced the retailing automobile dealers of America are desperate in their determination to find some method of self-preservation. I am not convinced the fault lies entirely at the doors of the manufacturers. An impartial investigation, a sincere inquiry into the whole subject of automobile production and merchandising should inform us where the causes lie, and then, together, we can correct them. Opportunity for a fair, legitimate profit, I believe, is the wish of the manufacturer for his dealers. Certainly that is an American economic principle we can all support."

Congressman Withrow will discuss automobile manufacturer-dealer relationships on a national hookup from 9.45 to 10 p.m., July 20, NADA announces.

It is understood that the probe, if undertaken, will be undertaken through the use of field investigators rather than by a public investigation by a Congressional committee.

Tractor Exports Increase

Exports of tractors and parts from the United States in May amounted to \$4,551,453, an increase of 51 per cent over the comparable 1936 shipments valued at \$3,004,241, according to the machinery division, Bureau of Foreign and Domestic Commerce. Foreign sales of tracklaying tractors showed the largest increase of the tractors and parts group being valued at \$1,786,631, an increase of 76 per cent over the \$1,011,708 exported during May of last year. Practically all of this gain was due to large sales of the fuel injection type in the size 60 and over drawbar horsepower, statistics show.



MORTIMER R. DENISON, assistant purchasing agent for the Studebaker corporation has gone to Cleveland, Ohio, where he will become associated with the White Motor company as supervisor of materials and manager of manufacturing stocks and transportation.

H. M. HEMPSTEAD has been appointed director of advertising for Hupp Motor Car Corp. He comes to Hupmobile directly from the Delco-Frigidaire division of General Motors. Previously he had served as assistant sales promotion manager for the Pontiac Motor Company.

BEN F. GEYER has been elected president of the Wayne Pump Co., Fort Wayne, Ind., succeeding the late William M. Griffin. He has been associated with the company and its predecessors for a quarter century.

STANLEY H. FULTON has been appointed legal counsel for the Automotive Parts and Equipment Manufacturers, Inc. He replaces J. W. Blanchard who resigned to go into private practice.

W. H. BLACKMER has resigned as sales manager of the Laminated Shim Co., Inc., to accept the vice-presidency and general managership of Packless Metal Products Corporation, Long Island City, N. Y., manufacturers of seamless flexible metal hose, packless fittings and other metal products.

MR. AND MRS. HENRY FORD will be honored for their generosity by Dearborn's school children on July 14 on the occasion of the suburb's eleventh annual civic holiday.

WILLIAM H. FUNSTON, president of the Firestone Tire and Rubber Company of Canada, Limited, Hamilton, Ont., was elected president of the Rubber Association of Canada at a recent meeting held in Toronto.

JAMES L. BROWN has been appointed vice-president of the Covered Wagon Co. in charge of sales.

FRANK T. SHEETS has been elected president of the Portland Cement Association effective Sept. 1. His experience has been along highway engineering lines.

PAUL FIELDEN, of the Norton Co., Worcester, Mass., has been elected president of the National Association of Credit Men. He has been a director and a vice-president of the association in recent years.

Cord Wins Stevens Trophy

Ab Jenkins, of Salt Lake City, Utah, established a new 24-hour speed and endurance record on the Indianapolis Speedway by driving a stock supercharged, front-drive Cord car a full day and night over the rough brick oval at an average speed of 79.577 m.p.h. The new record won him the Stevens Trophy, presented by Samuel B. Stevens, millionaire automobile devotee, which has been given under deed of gift with the Indianapolis speedway acting as trustee. The trophy may be contested for only by American manufacturers of stock cars. The trophy may be awarded at any time for the highest average speed for 24 hours over the Indianapolis speedway. The examining technical committee is appointed by the AAA and must consist exclusively of members of the Society of Automotive Engineers. Only standard fuels are used and are purchased by the technical committee.

Wants Back Issues

The Enoch Pratt Free Library, Baltimore, Md., is anxious to complete its file of Automotive Industries and solicits offers of Vols. 42, 44, 46 for 1919, 1920, 1921.

Ford Wages Average 90 $\frac{1}{4}$ c an Hour

(Continued from page 39)

New Burg and Dundee.

Formal hearing on the National Labor Relation Board's complaint against the Ford Motor Co., charging unfair labor practices, got under way in the Federal Building, Detroit, Tuesday morning, July 5.

John T. Lindsay of the trial examiners' office in Washington has been assigned to hear the case. The Labor Board is represented by three attorneys, headed by Lawrence Knapp, while Louis J. Colombo, Ford attorney, with two assistants and F. A. Thompson of the Ford secretary's office, represent the company.

At the outset, Colombo moved for dismissal of the case on the grounds that dismissal of workmen and other acts complained of did not affect interstate commerce and therefore did not come under the Wagner Act. He charged that the May 26 riot at the Rouge plant, one of the issues, was the result of a conspiracy on the part of UAW leaders and that Ford workers involved acted solely in self-defense. He also raised the issue of constitutional guarantees of free speech. His motion was overruled by Lindsay.

Two petitions to intervene were denied by the trial examiner. James E. Greene, Dearborn corporation counsel, had sought to intervene in behalf of Dearborn because an important issue in the case was that of ownership of the overpass to gate No. 4 of the Rouge plant. W. S. McDowell, counsel for the Ford Brotherhood, Inc., had asked to be permitted to intervene because of the charge in the complaint that the brotherhood was a company union. McDowell said he would take his motion to the Labor Board in Washington.

Most of the argument in the first day's hearing concerned the ownership or control of the overpass No. 4, scene of the May 26 riot when UAW organizers attempted to distribute union literature to Ford workers. The union claims that the fighting occurred on public property whereas the company contends that it has maintained control of the overpass which it built but leased to the Detroit Street Railways.

Rates	Day	No. Employees	Total Wage
.75	6.00	5,598	\$33,588.00
.77 $\frac{1}{2}$	6.20	2	12.40
.80	6.40	4,134	26,457.60
.85	6.80	22,532	153,217.60
.87 $\frac{1}{2}$	7.00	1	7.00
.90	7.20	29,464	212,140.80
.95	7.60	11,450	87,020.00
1.00	8.00	5,431	43,448.00
1.05	8.40	3,460	29,064.00
1.10	8.80	1,623	14,282.40
1.15	9.20	1,095	10,074.00
1.20	9.60	712	6,835.20
1.25	10.00	538	5,380.00
1.30	10.40	366	3,806.40
1.35	10.80	176	1,900.80
1.40	11.20	145	1,624.00
1.45	11.60	82	951.20
1.50	12.00	40	480.00
1.55	12.40	26	322.40
1.60	12.80	10	128.00
1.65	13.20	4	52.80
Totals....		86,889	630,792.60

UAW Disciplines Members

In line with action taken by the executive board of the United Automobile Workers to enforce discipline among union members, president Homer Martin notified three UAW organizers in Flint of their transfer to other assignments and demoted Robert C. Travis from organizational director at Flint to the status of organizer. Those transferred were Roy Reuther, William Cody and Ralph Dale. Organization work in Flint is to be handled by a committee of five members, all on the same basis.

Martin recently held a series of closed meetings in Saginaw for stewards and union members to exhort them to live up to their contract and not to permit unauthorized strikes. These meetings are said to be the first of a series in all cities which have General Motors plants indicating the union is paving the way for meeting conditions laid down by the GM president W. S. Knudsen before negotiations could begin on revising the corporation's contract with the union.

Medals for sitdown strikers are being distributed by the UAW. The decoration is being awarded approximately 10,000 persons in Michigan. On the face of the medal is inscribed: "Honor award for winning sitdown strike 1937," and on the back is written: "Officers of your international union appreciate your loyalty in the fight to improve American labor conditions."

Unfilled Orders Large

(Continued from page 39)

Chevrolet May sales were 102,475 cars and trucks, against 120,533 in April and 129,816 in May of last year. The company produced its 13,000,000th car on July 7, requiring 11 months and 2 days for the last million. Strikes added 60 to 90 days to the period.

Packard Motor Car Co. assembled 76,216 cars in the first half of the year, it was announced by M. M. Gilman, general manager. Output established a new record and compared with 36,418 for the like 1936 period. Factory shipments for the half year were 75,637 units against 35,732. Estimated retail deliveries were 65,389 against 33,119. Dealer stocks were said to be normal.

Steel shortage caused a shut down of the plant of Willys-Overland Motors, Inc. this week, after first half production 49,628 cars. Operations are scheduled to resume by July 12.

Reo Motor Car Co. production for the first five months of the year was 6318 units against 4554 for the like 1935 period.

Buick retail volume in the June quarter was the best attained for that portion of the year in a decade. Deliveries to domestic customers for the period were 66,663 cars, a gain of 26.6 per cent over the 1935 period. Domestic sales of 1937 models have reached 154,830 cars against 125,615 of the 1936s by the same date last year. Output for the June quarter was for home and export markets was 74,861 cars. Exports are running 8 to 10 per cent of the total volume.

Graham-Paige shipments in the last fifteen days of June were 1000 cars against 488 in the first fifteen days. Domestic shipments for the model year have been 13,999 against 13,281 last year.

GM Tax Case Appeal Planned

An appeal by the Bureau of Internal Revenue from a Board of Tax Appeals decision that General Motors Corp. did not report \$15,342,369 too little in its 1926 income tax return has been decided upon. The bureau urged the Department of Justice to file a plea in the District of Columbia court of appeals. The income questioned arose out of a deal whereby General Motors acquired the Fisher Body Corp. The case hinges on General Motors' tax liability on security transactions involved in the deal.

Evans Products in Purchase

Evans Products Co. last February completed the acquisition of the Coast Range Timber Co., the company reported to the Securities and Exchange Commission. The cost of the two-thirds interest acquired was \$32,509.

Bendix To Add Appliance

Bendix Aviation Corp. plans to enter the home appliance field within a few months, according to Chicago reports. The company will manufacture a washing machine for sale by a new unit, Bendix Household Appliance, Inc., in which Bendix Aviation has a 25 per cent stock interest. The program is to diversify the Bendix production somewhat more than at present. The washer is expected to retail for \$169.50.

MEMA Elects 12 Members

A. H. Eichholz, general manager, Motor & Equipment Manufacturers Association, announces the election to membership of the following manufacturers: R. E. Dietz Company, New York City, Do-Ray Lamp Company, Chicago, Ill., Embury Manufacturing Company, Warsaw, N. Y., Evans

AUTOMOTIVE INDUSTRIES

Looking Ahead

LIGHT METALS—Unusually interesting pictures are one of the things we like about the article on Applications of Light Metals in the Automotive Industries, which H. E. Blank, Jr., of our staff, will contribute to the issue of July 17. In August (issue of the 21st) the subject will be Applications of Rubber; the author, Joseph Geschelin. Both of these articles in the Materials Series will be supplemented by four pages of new developments in materials and materials' handling from the automotive standpoint.

IN THE LAST SIX MONTHS more than 90 per cent of **AUTOMOTIVE INDUSTRIES** readers renewed their subscriptions. This is considered by circulation managers to be a remarkable evidence of reader-interest for any publication. But we're not satisfied. During the next six months we have planned to introduce dozens of small innovations which we hope will contribute to the magazine's value to you. When they do—and when they don't—please tell us.—The Editor.

Products Company, Detroit, Mich., Fowler-Pem Company, Emeryville, Cal., Goodyear Tire & Rubber Company, Akron, Ohio, Sealed Power Corporation, Muskegon, Mich., Southern Friction Materials Company, Charlotte, N. C., Thompson Products, Inc., Toledo, Ohio, Trippe Manufacturing Company, Chicago, Ill., Ward Products Company, Cleveland, Ohio, Wayne Lock Company, Detroit, Mich.

April Tire Shipments Off

Shipments of pneumatic casings during the month of April are estimated at 5,560,453 units, a decrease of 3.9 per cent under the 5,787,051 in March, but 13.4 per cent above shipments of 4,904,116 units made in April, 1936, according to The Rubber Manufacturers Association, Inc.

The organization estimates production of pneumatic casings for April at 5,729,869 casings. This is a decrease of 3.1 per cent under the March total of 5,915,575, but is 18 per cent above April, 1936, when output was 4,857,083 units.

Pneumatic casings in the hands of manufacturers April 30, 1937, are estimated at 12,628,872 units, an increase of 1.5 per cent over the stocks on hand March 31, of 12,448,167 units, and 39.8 per cent above stocks on hand April 30, 1936, which were 9,034,707 units.

Detroit Rules on Trailers

An ordinance, governing the use of trailers for homes, has been passed by the Detroit Common Council. Trailer occupants are limited to a stay of not more than 90 days. Sanitary regulations were laid down for guidance of trailer parking lots and a license fee of \$20 imposed for each trailer parking space in the lot.

Bender Cuts Prices

The Bender Body Co., Elyria, Ohio, announces reductions in the retail prices of all its "Travel Mansion" models. Some of the reductions will amount to \$180. The company also announces development of an air conditioning system for its trailers.

Calendar of Coming Events

SHOWS

Second Winter Item Show, Automobile Accessories Association, Chicago, Aug. 9
Poland, Automobile Salon (Foire Orientale), LwowSept. 1-15
Yugoslavia, Automobile Section, Autumn Fair, LjubljanaSept. 1-12
Yugoslavia, Automobile Section, Commercial Fair, Belgrade.....Sept. 11-21
France, 31st International Automobile Salon, ParisOct. 7-17
Great Britain, 31st International Automobile Exposition, London....Oct. 14-23
Czechoslovakian Automobile Show, PragueOct. 16-24
National Automobile Show, New York, Oct. 27-Nov. 3
Toledo, O., Automobile Show...Oct. 27-Nov. 3
Italy, 10th International Automobile Salon, MilanOct. 28-Nov. 8
Boston, Mass., Automobile Show, Oct. 30-Nov. 6
Los Angeles, Cal., Automobile Show, Oct. 30-Nov. 7
San Francisco, Automobile Show, Oct. 30-Nov. 7
Cincinnati Automobile Show...Oct. 31-Nov. 6
Great Britain, 13th International Commercial Automobile Exposition (trucks and buses), London...Nov. 4-13
Chicago Automobile Show.....Nov. 6-13
Akron Automobile Show.....Nov. 6-12
Omaha Automobile Show.....Nov. 6-11
Brooklyn Automobile Show.....Nov. 6-13
Columbus Automobile ShowNov. 6-12
Detroit Automobile Show.....Nov. 6-13
Motor Truck Show, 4th Annual, Newark, N. J.Nov. 6-12
Newark, N. J., Truck Show.....Nov. 6-12
Buffalo, N. Y., Automobile Show..Nov. 6-13

Show Business

Manager of the National Automobile Show in New York is Alfred Reeves, 366 Madison Ave., N. Y. C. Inquiries concerning all matters connected with the national show should be addressed to him. **AUTOMOTIVE INDUSTRIES** will be pleased to furnish names and addresses of local show managers on request.

Indianapolis, Automobile Show....Nov. 6-13
Newark, N. J., Automobile Show...Nov. 6-13
Philadelphia Automobile Show....Nov. 6-13
Pittsburgh, Pa., Automobile Show..Nov. 6-13
Toronto, Ont., Automobile Show...Nov. 6-13
Great Britain, 36th Scottish International Automobile Exposition, GlasgowNov. 12-20
Baltimore, Md., Automobile Show, Nov. 13-20
Cleveland, Ohio, Automobile Show, Nov. 13-20
Jersey City, N. J., Automobile Show, Nov. 15-20
Milwaukee, Wis., Automobile Show, Nov. 17-24
Springfield, Mass., Automobile Show, Nov. 14-20
St. Louis, Mo., Automobile Show..Nov. 14-21
Portland, Ore., Automobile Show..Nov. 14-21
Denver, Colo., Automobile Show, Nov. 15-20
Montreal, Que., Automobile Show, Nov. 20-27
Kansas City, Mo., Automobile Show, Nov. 27-Dec. 4

CONTESTS

National and International Soap Box Derby Finals, Akron, Ohio.....Aug. 15
Pan American Cup Race, Roosevelt RacewaySept. 6
National Outboard Championship Regattas, Richmond, Va.....Sept. 18-19

CONVENTIONS AND MEETINGS

U.A.W. Annual Convention, Milwaukee, Aug. 23
International Congress on Carbohydrate Carburants, RomeSept. 10-12
S.A.E. Section Regional Tractor Meeting, Akron, Ohio.....Sept. 15-17
American Transit Association, 56th Annual Convention, White Sulphur Springs, W. Va.....Sept. 19-23
S.A.E. Section Regional Transportation Meeting, ChicagoSept. 29-Oct. 1
American Foundrymen's Association Midyear Meeting, Columbus, Ohio, Sept. 30-Oct. 1
S.A.E. Fuels and Lubricants Regional Meeting, Tulsa, Okla. ...Sept. 30-Oct. 1
S.A.E. National Aircraft Production Meeting, Los Angeles, Calif.....Oct. 7-9
American Foundrymen's Association, Regional Conference, Rolla, Mo., Oct. 8-9
National Metal Congress, Atlantic City, Oct. 18-22
S.A.E. Annual Dinner, Commodore Hotel, New York.....Oct. 28
American Petroleum Institute, 18th Annual Meeting, Stevens Hotel, ChicagoNov. 8-12
S.A.E. National Production Meeting, Flint, Mich.Dec. 8-10

Just Among Ourselves

"Men Working" In Africa, Too

FROM halfway across the world we have learned of the death of L. D. Galton Fenzi, honorary secretary of the Royal East African Automobile Association. Few of our readers, we suppose, have heard previously of Mr. Fenzi, and his association. Offhand it may not seem to have concerned the American automobile industry very much, but it was representative of a type of effort which has in the mass meant a great deal to automotive progress throughout the world. So, with your indulgence, we are going to take a moment to tell you the story.

In the center of the East African coast are three countries, Kenya, Uganda, and Tanganyika, collectively known as British East Africa, or as the "half-moon states," because their outer boundaries form a rough semi-circle bordering on Abyssinia, the Belgian Congo and the Egyptian Sudan.

The country is frequently mountainous and there are torrential rivers. Monkeys, rhinoceri, lions and other exotic animals are still among the hazards of the road. When Mr. Fenzi conceived the idea of an automobile association in British East Africa the circulation of motor vehicles was limited chiefly to the few large towns and the surrounding country. Roads were mere tracks leading into the jungle

and the only route guides were (sometimes) apocryphal excerpts from travelers' tales.

All that has changed. There are well posted roads threading between the leading towns of the colonies. Rest houses have been placed at intervals for the accommodation of travelers. Route maps show the direction and contour of East African roads as clearly as our own maps covering, say, New York State. There are more than 20,000 motor vehicles registered in British East Africa, a large proportion of them American.

The Royal East African Automobile Association has attained a position of respect and influence throughout its territory. Leading citizens in the three colonies are among its members and active workers.

African Achievement Has Counterparts

THESE achievements and many others which distance has dimmed were very substantially the work of Mr. Fenzi. We have the word of Sir Joseph Sheridan, president and chairman of the association, that without Mr. Fenzi's "magnetic personality it could not have survived its early years and, different from so many founders, from the very beginning to the day of his death, he personally watched over the welfare of the association. . . ."

Mr. Fenzi's achievement is a concrete memorial which would be hard to match anywhere in the history of automotive progress. Similar efforts on the part of many men, some living, some dead, have built the foundation on which the whole automotive industry rests. Carving markets out of the wilderness is a giant's game, whether the scene is East Africa or East St. Louis.

Decentralization— Will It Work?

We do not believe that decentralization programs will permanently solve labor problems in any industry, but they can do much to ameliorate them, judging by the experience of the Akron tire industry, as reported last week. Many of the beneficial results of decentralization seem to be analogous to those of isolating a sufferer from contagious disease. When the germ is removed from its natural growth medium it weakens and dies. In the case of industrial disputes, the natural medium seems to be the crowded industrial city. The Ford plan of small subsidiary industries in small towns, with the workers operating small farms, seems ideal in essence—if it can be made to work. If it doesn't work it will probably be an outcome of the difficulty of effectively managing many scattered operations.

In the automobile industry, the trend toward decentralization is marked, and is being carried out by the expenditure of millions in money, and a careful research for industrial sites whose development can be made an integral and effective part of the community life, to the benefit of both the manufacturing organization and the community. This is a relatively new trend, arising out of the new consciousness of industry of its responsibility to the community as a whole.—H. H.

It's the Motorist Who Pays the Bill

By RILEY E. ELGEN

MOTOR vehicle owners, competitors in transportation say, enjoy the free use of the public highways, or do not pay their proper share of road costs. We are further told by the competitors that they actually have to pay taxes in order to make these roads available to motor vehicle owners who, in turn, show their appreciation by taking from them a part of their own transportation business.

Those who pay the bills know the highways are far from free. Travelers on turnpikes paid at toll gates for the privilege of using the roads. Now every filling station is a toll gate and toll is paid at the gasoline pump and again and again at the several offices of the innumerable tax gatherers. So that in 1935¹ those who owned automobiles, trucks, buses, and what-have-you in the way of a gasoline and oil consuming vehicle paid \$1,017,824,700 in various kinds of taxes, according to the Census Bureau. *Facts and Figures of the Automobile Industry*² states that motor vehicle owners paid in 1935 \$322,481,415 in state registration fees, \$616,851,671 in gasoline taxes, \$273,324,821 in Federal excise taxes and \$73,500,000 in personal property, city, county, and town taxes or a total of \$1,286,157,907.

It should be remembered that there are around 30 million motor vehicles and almost every family has a private automobile or two. When the expenses of any class of motor vehicle owners are increased similar expenses to all motor vehicle owners are inadvertently increased also, and those other kinds of tax payers, as well as to nearly all registered voters—a rather powerful group if it ever decides to go on a rampage.

The always current controversy about taxes which rages between railroads and motor carriers (buses and trucks)

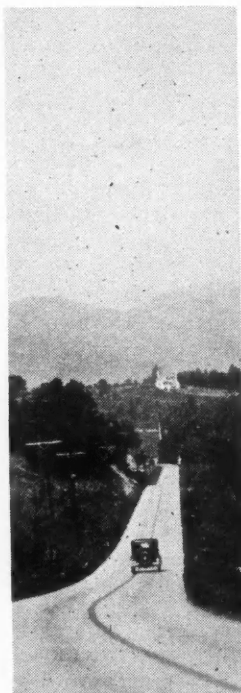
serves to illustrate how the innocent are made victims of competition. Now when the superior ability of the railroad leadership, born of a century of experience, is able to convince some tax gathering agency that their competitors must be taxed heavier, we who are not concerned in that effort to smother competition suffer along with the motor carriers. In order to shed some light upon the subject of who pays and who does not, it is necessary to compare the taxation of motor vehicles with the railroads' expenses of maintaining their own "highways," including also the taxes they pay.

To do this in a logical and fairly equitable manner it is assumed that the country as a whole is divided into districts which will be called the eastern, southern, and western in order to conform them territorially to those divisions of the country made by the Inter-

state Commerce Commission for the purpose of regulating railroads.

In the case of the Eastern District we can easily break that up into the New England Region and the remainder. When this result has been achieved it is found that New England collects \$5,440 per mile of state highway in taxes from the highway users, that is, the owners of motor vehicles. The cost of maintaining the New England railroads' roadway and structures plus taxes paid by them all add up to \$3,885 per mile of road. The difference between these two sums is \$1,555 per mile, an amount sufficient to pay the interest at 4 per cent on \$38,875 of road bonds, on every mile of paved road, although of course, there is actually no such outstanding debt.

That the significance of these comparisons may be better understood, it might be well to explain the status of state highway and bridge bonds³ from the first issue (1894 in one instance) to the end of the fiscal year in 1930 shows that bonds were authorized for use in road construction in the aggregate amount of \$1,820,982,000 in 34 states. Three of these had no state highway bonds outstanding, the remaining 31 states had \$1,050,302,288 as of the fiscal year 1930.



THOSE who pay the bills know the highways are far from free. Travelers on turnpikes paid at toll gates for the privilege of using the roads. Now every filling station is a toll gate and toll is paid at the gasoline pump and again and again at the several offices of the innumerable tax gatherers. So that in 1935 those who owned automobiles, trucks, buses, paid \$1,017,824,700 in various kinds of taxes, according to the Census Bureau.

¹ See Census Bureau, Department of Commerce Report.

² 1936 Edition, page 23.

³ U. S. Department of Agriculture, Bureau of Public Roads, B-1 (1930).

Georgia, Florida, Mississippi and Kentucky had no state road bonds outstanding, the other southern states had bonds outstanding ranging from \$900 in Virginia to \$16,000 per mile in West Virginia, a simple average of about \$4,500 per mile for all southern state roads. New England state highways were bonded for about \$3,600 per mile on the average. In the middle Atlantic states only New Jersey had any large amount of bonds outstanding (\$35,000 per mile), the others varied from \$2,300 to \$6,500 per mile. Only three out of six central states had highway bonds outstanding, they ranged from \$4,000 to \$14,800. The Plains states had no outstanding state highway bonds. When all of the surfaced state highway mileage in 1930 was divided into the total of all the outstanding highway bonds, the figure \$4,000 was obtained as the average, the interest rate was 5 per cent, so that bond interest amounted to only about \$200 per mile on the average. Of course, relatively speaking, there has not been many new road bonds issued since 1930 because of the depression. The tendency is to pay as you go.

In addition to these state highway bonds there were \$1,826,924,000⁴ in local road bonds outstanding. The interest on these was not supposed to be paid from gasoline taxes, so far as the record indicates. Except in a few instances these bonds are financed from the general fund or through special taxation. These local road bonds were outstanding in all states except New Hampshire, seven states each had less than one million in these bonds, while five had more than one hundred million outstanding, six states, Pennsylvania, Florida, Texas, Ohio, North Carolina, and New York, account for nearly one-half of the total of all local bonds. These local road bonds frequently were defaulted in some states during the depression.

According to "State Highway Expenditures—1935," published by the United States Department of Agriculture, Bureau of Public Roads,⁵ and compiled for the calendar year from reports of state authorities, and a companion tabulation "State Highway Mileage Built—1935,"⁶ it cost approximately \$18,000 per mile to build state highways

down South, \$60,000 in New England and the middle Atlantic states, \$40,000 in the central states, and \$4,500 on the great plains (mostly gravel). Dividing all the money spent on new highway construction by all the mileage of state highways built gives \$16,000 per mile. Of course, there is no such thing as an average mile of road. Neither the Bureau of Public Roads nor any other authority would hazard a guess on the cost of such a mile in different sections of the country.

In the eastern district outside of New England, that is roughly the territory north of the Potomac and Ohio Rivers and east of the Mississippi, motor vehicle operators pay \$6,111 per mile of

state road used while it cost the railroads in that territory \$4,201 per mile of road for maintenance and taxes. The difference between these two sums would leave the governmental agencies \$1,910 per mile, or a sum sufficient to pay the interest on road bonds issued at the rate of \$47,750 per mile of road.

Going down South it is found that it costs the motor owner as well as the railroad operator less per mile, in the case of the former it is \$2,800 and in the latter \$2,591, leaving \$209 per mile of highway for payment of interest on bonds.

Out West the tax gatherer has to get along as best he can on \$2,608 per mile of road while it costs the railroads in

TABLE A

State Highway Expenditures—1935, compiled for the calendar year from reports of state authorities.

Capital Outlay—	
Acquisition of right-of-way	\$16,077,000
Construction of roads	354,950,000
Construction of bridges	45,385,000
Total Capital Outlay	\$416,412,000
Maintenance—	
Primary state highways ² (Rural)	150,335,000
Secondary roads—under states	29,861,000
Urban extension of state roads	4,262,000
Total maintenance	\$184,458,000
Net expenditures for equipment	6,819,000
Administrative—Engineering, etc.	30,653,000
State highway police	6,806,000
Interest on state highway obligations ...	67,918,000
Total expenditures of state highways	\$713,066,000
Retirement of state highway bonds, etc.	55,756,000
For local roads and streets	56,938,000
Other highways not on state systems	1,228,000
In non-highway purposes	21,367,000
Total expenditures	\$848,355,000
³ Balance on hand December 31, 1934	\$159,335,000
Balance on hand December 31, 1935	\$198,040,000
Reserved for debt service, December 31, 1935	\$159,550,000
³ Reserved for debt service, December 31, 1934	\$144,483,000

(1) Table SF-2, 1935, issued November 11, 1936, United States Department of Agriculture, Bureau of Public Roads.

(2) 331,867 miles.

(3) From similar table for 1934.

⁴ U. S. Department of Agriculture, Bureau of Public Roads.

⁵ Table SM-2, 1935, issued 11-11-1936.

⁶ Table SMB-1, 1935, issued 11-11-1936.

maintenance and taxes \$1,795. On the assumption that motor vehicle operators should pay at least a similar amount, \$813 per mile would be left over for the use of the states in the payment of bond interest, which at 4 per cent would be equivalent to \$20,325 bonded debt per mile, or could be put away as depreciation reserve for rebuilding the road later or used for building more roads.

All the money paid in taxes by motor vehicle operators in all the states of the Union, when divided by all the road mileage to which they apply, would equal \$3,620 per mile. A similar treatment of the expenses, taxes and maintenance of railroads would result in \$2,530 per mile of road. The difference, \$1,090, is enough to meet the interest on \$27,250 of road bonds on each mile of highway.

Of course, it does not cost as much per mile to maintain public roads as it does railroads. As a matter of fact, the best obtainable information shows that it costs not more than \$1,400 per mile, on the average, to maintain public highways in the United States, leaving at least \$2,220 per mile of all surfaced highways for construction, interest, or depreciation reserve purposes, whichever way you want to look at it. In other words, the highway users are not only paying their way but they are contributing a sufficient sum to further improve transportation facilities as well as paying the interest on all outstanding bonds. Thus they are contributing more toward the upbuilding of the nation than any group or class since the era of railroad building, that is, during the period from their inception up to the beginning of commercial use of motor vehicles.

Charles Dwight Curtis, chief, Division of Control, U. S. Bureau of Public Roads, has said:

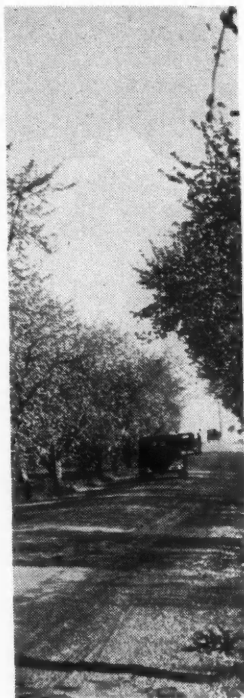
"The expenditures of the state highway departments for maintenance work in the past two years have been about \$180,000,000 annually. . . . Thus the annual expenditure for maintaining rural highways exceeds \$350,000,000."

In this same article it was said that state highways are maintained from:

"The collections of the state gasoline taxes or motor vehicle license fees, and the road user pays the full bill."

In the case of the secondary roads such funds form only a part of the expense of maintaining them and special road levies or appropriations are made from general tax funds. Other roads serving those living on the lands adjacent to them are maintained from general or property taxes.

One hundred and forty-two million



HIGHWAY users, competitors of railroads, contributed taxes to the maintenance, construction, road debt use, and for other road purposes aggregating at least $3\frac{5}{8}$ times that paid by railroads on the basis of the same yard stick. When the relative tax burden of these two competitors are compared on a per hundred-dollar-value basis the comparison is as 25 is to 1 against the pocket books of motor-vehicle owners.

dollars of the proceeds of the gasoline tax and of motor vehicle license fees were diverted in 1934 to purposes in no way related to the construction, maintenance and financing of public road construction.

The taxes paid by owners of motor vehicles in 1934 amounted to \$25 per \$100 of value, while their competitors, the railroads, paid \$1 on each \$100 of value or book investment.

Dean T. R. Agg of the Engineering Department of Iowa State College has said:⁷

"The state highway program is financed through user taxes and Federal aid funds, and the improvement of municipal highways and of secondary roads is financed largely through property taxes."

This is confirmatory of the statement quoted from the article by Mr. Curtis.

The Division of Information, Bureau of Public Roads, United States Department of Agriculture, under date of May 25, 1937, stated:

"In 1935 the state highway departments maintained 331,867 miles of primary state roads at a cost of \$150,335,000 or approximately \$460 per mile. This figure does not represent the average cost of surface maintenance since it includes such items as snow removal, erection of signs, painting guide and warning lines, cutting weeds and other work on shoulders and ditches."

A tabulation compiled by the Bureau of Public Roads, Nov. 11, 1936, the summary of which is exhibited by Table A below, shows that a total of \$184,-

458,000 was spent on maintenance including secondary roads, and urban extension of state roads. That amount checks fairly well with the sum given by Mr. Curtis, referred to above.

*Automobile Facts and Figures*⁸ states that the total of state registration fees for 1935 was \$322,481,415 and state gasoline taxes amounted to \$616,851,671 or a grand total of \$939,333,086. Now since the revenue of state highway departments aggregated this latter amount and since it has been shown that the maintenance expenses of state highway departments was \$184,458,000.⁹ There is a remainder of \$754,875,086. As all of the state highway expenditures for new highways and bridges total \$416,410,000,¹⁰ there would still remain \$338,463,086. Of this amount \$183,200,000¹¹ was available for interest, sinking fund, retirement of debt, administration, engineering, police and related items, leaving \$155,000,000 more or less to assist municipalities, counties and townships in their road problems. From these facts it is apparent that the highway users more than pay their way.

According to the Bureau of Public Roads, the states built, improved, and surfaced 26,814 miles of road in 1935 at a cost of \$416,412,000 which indicates an average per mile cost of about \$16,000.

Of course, one of the things which the railroads are suffering from and always have is the large amount of interest which they have to meet annually on their debts. This amounts to about

(Turn to page 69, please)

⁷ *Engineering News-Record*, Nov. 30, 1936.

⁸ *Engineering News-Record*, Nov. 19, '36.

⁹ 1936 Edition, p. 23.

¹⁰ See Table A.



AUTOMOTIVE ABSTRACTS

Better Roads in Great Britain

IN an address before the National Safety Congress in London, Captain Hudson of the (British) Ministry of Transport spoke on the need for road improvement in Great Britain. He is engineer of the Greater London Highway Development Survey and his remarks related mainly to the need for improvements in the vicinity of the metropolis. Referring to the increase in accidents, he said the ambiguity apt to arise in the center of a busy 30-ft. carriageway could not occur on dual carriageways separated by a central reserve. The Restriction-of-Ribbon-Development Act would lead to cooperation between neighboring councils, enabling them to provide standard layouts for routes traversing several administrative areas, which would be conducive to public safety. There was need for street widening in built-up areas, and the construction of new roads of modern design which would link up the new arterial roads discharging into London. Slow progress was being made in allotting different levels to different streams of traffic. Vertical segregation was still unfamiliar. There were localities where the lie of the ground would lend itself admirably to the construction of tunnels and vehicular subways. One of the tunnels proposed on the outskirts of Paris was designed to have five traffic lanes. Similarly, the advantages of long viaducts needed careful and unbiased consideration. New York furnished worthy examples. The "fly-over" junction, which had become almost standard practice on German super highways, was less familiar in England. A model of the cloverleaf junction was exhibited at the Congress and this layout might well be given an early trial.—*The Engineer*.

Higher Speeds, More Power

IN his presidential address to the Institution of Automobile Engineers, Capt. J. S. Irving, designer of the Golden Arrow racing car, gave an outline of what he considers will be the development of the passenger automobile. He thinks that within the next decade the average power output of the automobile engine will be in the region of 90-100 b. hp. at its normal speed, which must be such as will ensure a high factor of safety when operating at this speed for long periods. When suitable roads are available, steady speeds will be maintained and there will be fewer rests for the power unit.

To obtain the best streamline, the engine will probably have to be located at the rear, and this, in turn, will tend to improve the comfort of the passengers by a reduction in noise and fumes. The new engine position will necessitate fresh study in weight distribution to obtain stability, particularly at the high speeds that are anticipated.

The wheel track will probably be widened to balance the increased wheelbase, necessitated by the greater overall length required to obtain a better streamline and stability. It must be remembered that the only control is that provided by the wheel adhesion, and a longer wheelbase and wider track will be an advantage.

The present proportion of wheelbase to overall length is of the order of 1:1.63, and that of width of body to overall length, 1:3. A reasonably streamlined body will require a length/width proportion of at least 4, and as the minimum width necessary to accommodate three people abreast is approximately 5 ft., the body length will be at least 20 ft. and the wheelbase must be lengthened to at least the present proportion of 1.63:1 (147 in.) if reasonable stability and road adhesion are to be obtained.

Although roads will be well surfaced and reasonably level, independent springing will still be called for, owing to the increased stresses at the high speeds, the increased road adhesion required for control, and the necessity of definitely locating the axles in relation to the frame. Only independent suspension with a minimum unsprung weight at both front and rear will assure the required adhesion, stability, and steering control. Definite axle location will also be required to withstand braking torques at these speeds. The body will have to be regarded as the backbone of the car and will have to be designed accordingly.—*I.A.E. Journal* for November.

Inverted 4 Cylinder Engine on New Plane

A NEW light plane for private flying, the de Havilland Hornet-Moth, recently announced in England, is equipped with a four-cylinder inverted air-cooled engine known as the Gipsy-Major, of 4.65 in. bore and 5.5 in. stroke (373.7 cu. in.). Its normal horsepower is 120 at 2100 r.p.m., and the maximum output 130 at 2350 r.p.m. It weighs with propeller hub is 300 lb. and the fuel consumption is 6.5 Imp. gals. per hour at cruising speed and 9.75 gals. per hour at full throttle. The compression ratio used is 5.25. Cylinder barrels are machined up from carbon-steel forgings and cylinder heads are cast of aluminum bronze, which obviates the need for valve and spark plug inserts. Only one pair of valves are used per cylinder. Pistons are of heat-treated aluminum alloy and of the slipper type. Connecting-rod caps are held in place by four bolts of high-tensile steel. The nickel-chromium crankshaft, which is machined all over, runs in five plain bearings, with a ball bearing at the forward end to locate the shaft and take thrust in both directions.

Crankcase and top cover are light-alloy castings and are bolted together in the plane containing the crankshaft axis. Two magnetos are mounted on platforms near the ends of the cross shaft, to which latter they are connected through Simms flexible vernier couplings. An impulse starter is incorporated in the magneto on the starboard side. The spark-advance levers are inter-connected with the throttle so that the spark is automatically advanced to suit the engine speed. A Claudel-Hobson down-draft carburetor is fitted on the starboard side.—*Engineering*, May.

PRODUCER

MOST European countries at present are making great efforts to develop native sources of motor fuel. There are petroleum deposits of any consequence only in Southern Russia, Roumania, and Czechoslovakia, and all other countries are dependent on import for petroleum products. With growing development of industries and increase in the use of motor vehicles, the sums which must be spent abroad annually for petroleum and petroleum products are coming to be a very large item in the foreign trade balances of most of these countries. Besides, there is always the possibility that in the event of war they will be cut off from their sources of supply.

At the present time the two most promising substitute fuels in most of these countries seem to be gasoline produced from coal by synthetic methods, and solid fuels such as wood and charcoal used in gas producers. Synthetic gasoline undoubtedly has many advantages over producer gas, especially for use in private vehicles, but the chemical plant required for its production necessitates a very large capital investment. Besides, there seems to be no possibility of producing synthetic gasoline at anywhere near the cost at which the petroleum distillate is being delivered at ports of entry at present.

The most attractive feature of producer gas is the low cost of the solid fuel used in the producers. Of course, the producers themselves and their auxiliary equipment involve a considerable layout on the part of the vehicle owner, but many European governments encourage their use by granting tax exemption to owners of trucks equipped with producers, and in some cases a bonus or premium is paid.

While there had been talk of the use of gas producers on motor vehicles almost since the beginning of the industry, the first practical development of producers took place in England during the war, when gasoline was extremely scarce and motor buses were being operated on coal gas carried in collapsible bags on top of the vehicle. A number of different producer systems were developed, but no real industrial development followed, probably because shortly after the war gasoline was available again at low cost.

Some years later the automotive gas producer was taken up in France, where the Government decided to grant exemption from the annual tax and pay a bonus to purchasers of producer-equipped trucks meeting certain specifications. Considerable engineering work has been done in that country on producers and the necessary auxiliary equipment, and trade directories list quite a number of producer manufacturers. Moreover, competitions for vehicles using native fuels are being held under Army auspices each year. So far as can be learned, however, the number of producer trucks in commercial service is still relatively small.

One of the latest of the European countries to take to the gas producer was Italy. Steps to encourage the use of native fuels were first taken there some time before the start of the Abyssinian campaign and special effort was put behind the movement when in the course of the campaign it looked as though petroleum supplies might be cut off. Various steps taken by the Italian Government in its endeavors to develop the use of native motor fuels and some of the consequent technical development are outlined in this article by an Italian correspondent.

OPERATION of vehicle engines on producer gas was first being given consideration many years ago, but no practical results were obtained. The problem was taken up again, with greater chances of success, in Italy in 1933. In 1934 Professor Ferraguti successfully completed a run to Vienna and Budapest (893 miles) with a small Alfa car using charcoal as fuel, under very adverse atmospheric and road conditions. This proved definitely that charcoal gas can be used successfully not only in large stationary engines, but also in the engines of small road vehicles, with great savings on the cost of fuel, without material reduction in engine power, and without annoyance to passengers.

The above-mentioned demonstration run and successful experiments with alcohol and methane fuels convinced the Italian Fascist Party of the desirability of replacing gasoline in commercial motor vehicles with producer gas, alcohol or methane. As a result, a decree was issued on July 5, 1934, which, for a period of five years, exempts motor vehicles using these substitute fuels from the annual tax and provides for an annual bonus to be paid to the operators of such vehicles.

Toward the end of 1935 an "Inter-ministerial Commission on Transportation by Producer Gas" declared itself in favor of the use of charcoal instead of wood in these automotive gas producers, and recommended further experimental development. It was pointed out in the report that charcoal yields a relatively pure gas, which causes no deposits in the fuel lines and in the engine, even if the latter is idled for a considerable time. Under these same conditions wood is subject to a process of distillation which gives rise to a large amount of tarry material.

The advantages inherent in the use of wood were fully demonstrated in an international competition for new motor

GAS VEHICLES

*Cut fuel costs 80 per cent
in test runs and are
giving good service over
extended periods in Italy*

fuels, in which two vehicles of Berliet make attained a speed of 50 m.p.h., with a specific consumption of 1.06-1.10 lb. of wood per mile, at a cost of 8 lire, or 64 cents, per 100 miles, as compared with \$3.20-4.00 for gasoline used under the same conditions. Fully-loaded motor trucks consumed 2.84 lb. of wood, or 1.60 lb. of charcoal per mile.

Toward the end of 1935 a Technical Committee representing the corporations and industries interested in the subject, was charged with the organization of a competition for solid, liquid and gaseous substitute motor fuels. During this contest, vehicles using the new fuels were driven for a whole day in competition with gasoline-propelled vehicles over both level and mountainous roads, and the contest proved another success for the gas producer.

Fiat Producer-Gas Vehicles

The first developments by Fiat in this line consisted of various types of "National" automotive gas producers, which were installed on vehicles with which lengthy demonstration and prop-

aganda trips were made, extending the whole length of the Italian peninsula. These early vehicles competed quite successfully in the recent national and international prize competitions. Early in 1936 Fiat placed on the market a new gas-producer type motor truck, Model 634-G, and a gas-producer type motor bus, Model 635 RGL. Both of these were based on earlier models equipped with Diesel engines, but had engines with about 20 per cent more displacement. Four other types were produced later, and all received the official approval of the "Interministerial Committee of Automotive Gas Producers," hence purchasers are entitled to the tax relief and the bonus granted by the decree of July 5, 1934.

In these vehicles, 10 lb. of charcoal is said to give the same mileage as one U. S. gallon of gasoline. The producer functions continuously and supplies a gas which analysis has shown to be rich in carbon monoxide and hydrogen,

hence one with a high heat value. Before being delivered to the engine, the gas is cooled, and a uniform temperature is said to be maintained even in hard driving and on steep grades. For this reason the engine develops full power and no changes are required in the final drive ratio. The engine is always started on charcoal gas and no auxiliary gasoline supply is needed. This is said to be made possible by a special design of the mixer in which the two gaseous currents (air and producer gas) are brought together, one having an axial and the other a tangential movement, which assures a thorough intermixture.

An illustration of the Fiat "Nostrom 634-G" motor truck is shown in Fig. 1. It is said to be the result of a long series of developments and to require very little service. The gas producer is located on the left side of the driver's cab, and in order to shield the cab against heat from the producer, a 2-in. air gap is allowed between producer and the curved wall of the cab. The cab at this point has a double sheet-steel wall, the space between the outer and inner sheathing being filled

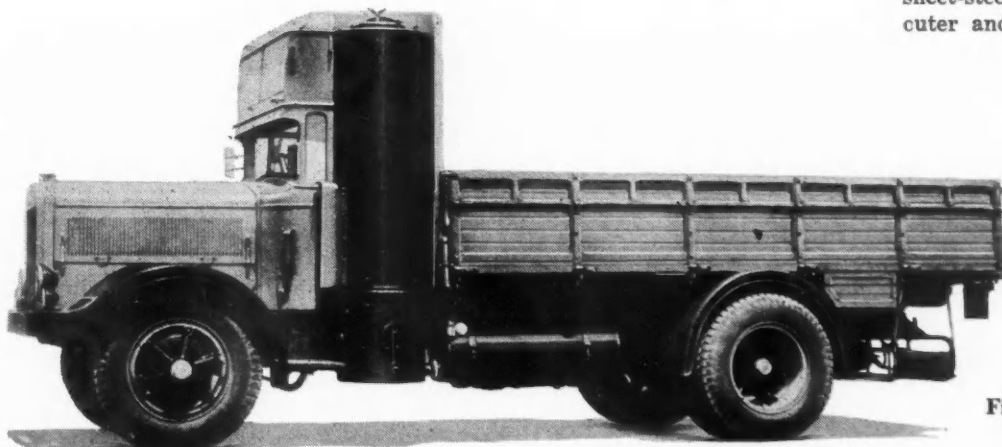


Fig. 1—Fiat 7-ton truck with gas producer at side of cab

with heat-insulating material. Adjacent to the gas producer is placed the scrubber. On the left and symmetrical with the scrubber are arranged the gas filters, which are located in a single housing to which the fan is attached. The gas cooler is located at the rear of the chassis frame between the side members. A 20-gal. tank containing water for the gas producer is located under the driver's seat, while about 330 lb. of charcoal can be carried in bags in a recess in the cab.

The 634-G, which has a pay-load rating of 7 tons and is said to be capable of hauling, on good roads, a trailer also carrying 7 tons, is equipped with a six-cylinder engine of 115 by 160 mm. bore and stroke (about $4\frac{1}{2}$ by $6\frac{1}{4}$ in.), which makes the displacement 608 cu. in. The engine works with a compression ratio of 8 and is governed at 2100 r.p.m.

The charge of the producer amounts to 400 lb. of charcoal, and the truck has a radius of 100 miles without recharging the producer and 185 miles with the whole supply of fuel carried. The fuel consumption of the fully-loaded truck is said to be 3.2 lb. of charcoal per mile.

Fig. 2 shows a producer-gas bus furnished the city of Rome, which has been in service for some time. Here the producer is located at the extreme rear of the streamlined body, which latter is insulated with Vetroflex in such a way that heat from the producer cannot get into the body. The scrubber and gas cooler are placed on the left side of the chassis, while on the right there are



Fig. 2—Fiat bus in service in Rome with gas producer at rear of body

two separate filters, one of the cases containing metal shavings, the other cloth. The producer has a capacity of 308 lb. of charcoal, which is sufficient to give the vehicle the radius required in passenger service. At its sides are located two water tanks with a combined capacity of 20 gals. This water is fed to the firebox of the producer. The engine is the same as that on the truck.

The Nostrum gas producer, which is manufactured in the Fiat plant, is of the downdraft type. As shown in the schematic drawing (Fig. 3), the gas-generating system besides the producer

G and the water tank H, comprises a scrubber E, a gas cooler C, a fan V, a three-way valve D, a series of metallic and cloth filters, F, a differential pressure gage N, a vacuum gage X, a gas mixer M, and an ejector A. The upper part of the producer serves merely as storage space for charcoal, which is fed gradually to the fire bed at the center, and the ashes collect at the bottom. The furnace portion of the producer is made of sheet steel and lined with fire brick. Its grate can be moved around its vertical axis. Cooling of the furnace walls is effected by moist air which circulates through a cooling jacket and enters the furnace through the lower injector. In this way, finely-atomized water is drawn from a sprayer by the air current and mixes with the air, the water being vaporized in the jacket space referred to in the foregoing.

The mixture of air and steam enters the producer at the top and passes down through four annular openings. In the fire chamber it comes in contact with the incandescent charcoal, and there it forms the fuel gas. It passes from there through the ash box into the scrubber E. This effects a preliminary cleaning of the gas, advantage being taken of the greater inertia of solid particles, which are caused to separate out as a result of sudden changes in direction and velocity, and deposited on the walls. Here the gas also is cooled somewhat slightly. The scrubber is provided with small doors through which the siliceous deposits may be removed.

Next the gas passes through the regular cooler C, which may be of any one of a number of different types, the type illustrated consisting of a series

(Turn to page 62, please)

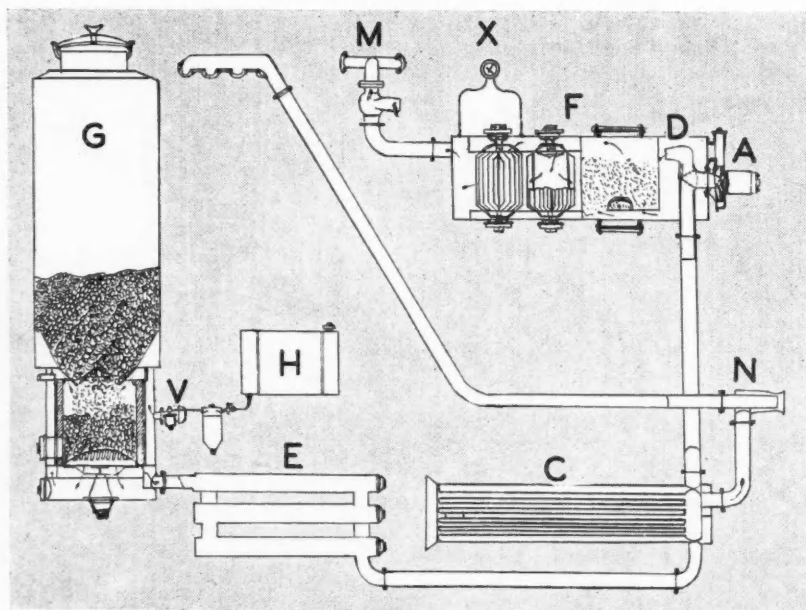
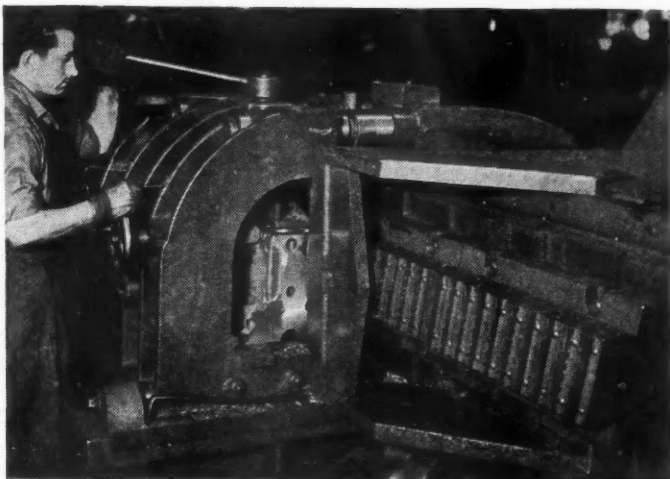


Fig. 3—Schematic arrangement of Fiat producer-gas system for motor vehicles



Hydraulic broaches on De Soto's engine line for finishing the manifold side of the cylinder block. The vertical blades on this machine have a cutting speed of 26 feet per minute, finishing a block in slightly over a minute's time

Production Lines

used to measure the force of attraction between the nickel coating and a small permanent magnet. The thickness is indicated by the reading of the dial which has been standardized against a similar coating of known thickness. Before testing coatings of unknown nature, they should be annealed for a short time by heating at 750 deg. Fahr.

Better Precision

Fred W. Cederleaf, in his paper on the contributions made by the machine tool industry which was presented at the recent ASME meeting in Detroit dwelt at some length on the slow but sure improvement in fine fits. It took about ten years to reduce the tolerance on the diameter of cylinder bores from 0.001 to 0.0005 in. And even today only a few car builders are in a position to bore within 0.0005 in. out-of-round and taper. This is only one of the examples mentioned by Cederleaf but it visions a remarkable picture when you consider that the mass-production process now has tools which without supervision do a better job than a skilled tool maker could produce with time and painstaking care.

On Buying

We were asked recently to give the answer to a very innocuous sort of question, namely, who are the people concerned with the specifying and acceptance of sheet steel and strip. It sounds easy—but you try it some time. We found it to be a rather complex problem due to the fact that deep-drawing stock as is required today, is a very technical product. It involves the engineering department, the metallurgist, the purchasing agent, factory standards, inspection, mill contact men, press shop management, die design, die shop. These and more enter the picture although the influence of one or another varies with the organization and the specific problem. Of course, in the final analysis, the steel mill shoulders most of the responsibility for a perfect product. And from that fact you can ap-

preciate what the steel boys are up against.

American Standard

Standardization of familiar machine tool elements grows apace. The latest development, that of an American standard for interchangeable forming tools, is recorded in the May issue of *Industrial Standardization*. It has resulted in cutting the number of blank sizes for circular and dovetail forming tools from 50 of each type to just six of each. That's good news for both manufacturer and user.

Zinc Castings

One of the best applications of the zinc die casting that we have seen in many a year is in the design of the oil control unit for the Olds automatic transmission which was announced recently. Here is an intricately-cored valve element comprising the very heart of the hydraulic system of the transmission. The die casting makes a strong, durable unit combining all the intricacies of the valve passages at the lowest possible unit cost since machining is held to the very minimum. An interesting commentary on this is the fact that experimental castings took about two week's of a toolmaker's time for machining.

Gages Nickel

A non-destructive method for measuring the thickness of nickel coatings on metals such as brass and zinc has been developed by the Bureau of Standards. In this test, a small spring balance is

Unfilled Needs

Wonderful strides have been made in machine tool design in recent years and this progress has made its imprint on precision and lower costs in automotive manufacturing. There still remains a rich and relatively untapped source of service and profit to all. We refer to the potential of what has been happily termed "unfilled needs," i.e., the gamut of refinements and tricks that many master mechanics dream about. If you are on the lookout for new business, you'll find it in the "unfilled needs" storehouse.

Injury Statistics

A forward step has been taken in the compilation of industrial accident statistics by the introduction of a new standard for injury statistics. According to *Industrial Standardization*, the term "disability" has been adopted to replace the out-worn criterion, "loss of time" which considered only totally disabling accidents. The new accident rate formula is expected to give a much better picture and a sounder basis for comparison and study.

Variety Materials

Had an interesting visit in the plant of the Warner Electric Brake in Beloit recently. Here is a relatively small unit intended for house and truck trailers and yet its complication of detail is amazing. Of particular interest is the use of a great variety of different materials in the construction of the brake and its controls. Here for example are parts made from Bakelite, molded rubber, copper and bronze,

stainless steel for flat springs, chrome-nickel forgings and castings for cam levers, steel and iron castings, etc. No question that materials play a big part in automotive manufacture.

Cuts Average

Received a little note the other day by way of a progress report on the performance of the new drop forging hammers. Some indication of what can be done with new equipment is gained from the fact that the Chambersburg Model H board drop hammer has reduced the number of blows per forging, an average of 20 per cent.

Board Aid

Knights of the drafting board will welcome a new wrinkle developed by New Departure. It's a folder contain-

ing full size sections of N.D. ball bearings for layout work. In all there are 19 sheets including sections of every standard bearing used in automotive work. We predict that layout men will find it a big help and will go for it in a big way. Ask us how to get this folder.

Soluble Practice

One of the largest auto plants recently effected a tremendous change in the simplification of its soluble oil usage. Under the new program, only two standard mixtures are piped for machine use. They use a 50 to 1 mixture for all metal removal where soluble oil is desired, and a 100 to 1 mixture for all grinders. Here, indeed, is a new slant on how low mixture strength may be used to produce good results in mass production.

Power Ducts

It's spreading widely, this idea of overhead power ducts with plug-in outlets at frequent intervals. Many of the larger plants have had this form of wiring for machine tool power lines for many years, due to the flexibility it provides for the movement and changing about of equipment. Now the smaller plants are beginning to adopt this idea, particularly as they swing over to individual drives.

Easy Lock

A novel cotter pin of spring steel formed like a safety pin has been demonstrated to some of the auto builders. Its appeal lies in the fact that when the head is pushed into a slot or hole it snaps in place automatically. One application is for locking connecting rod fastenings. —J. G.

Drill Machines That Facilitate Crank Balancing

TWO crank balance drilling machines recently installed in the Fort Wayne works of International Harvester Co., have produced gratifying results during a period of some four months' operation. Balancing of crankshafts has been greatly facilitated by the ability of this equipment to hold accurately to the depth of drill required.

A crank balancing machine is shown in Fig. 1. One machine is arranged for drilling into the crank pins, the other for drilling into the counterweight between No. 1-2 and No. 5-6 pins. Both machines are equipped with standard W. F. & John Barnes, Sr-2 hydraulic square ram drilling units, shown in Fig. 2.

The hydraulic heads are fitted with a Vernier depth drilling trip, using a

very large vernier wheel as shown. In operation, after the shaft is clamped in the fixture the drill point is brought forward into position by means of a large hand wheel at the end of the machine bed. Then the operator sets the vernier to the depth established on the balancing machine and starts the machine and feed by hand control. The drilling head automatically drills to the

proper depth, stops, and returns to its starting position.

The unique feature of the sensitive drilling head is the quick-setting hydraulic trip which is used in conjunction with the Barnes hydraulic system. This combination makes it possible to stop the drill point within 0.005 in. of the required setting without the use of a positive stop.

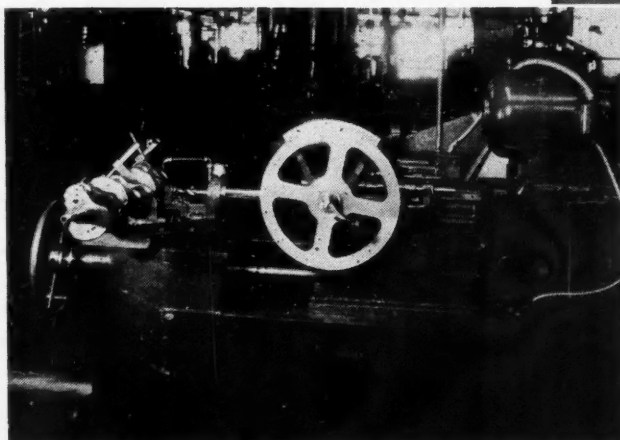


Fig. 1 (Left) One of the IHC crank balance drilling machines fitted with the S. F. & John Barnes hydraulic ram units. Note larger vernier in the center

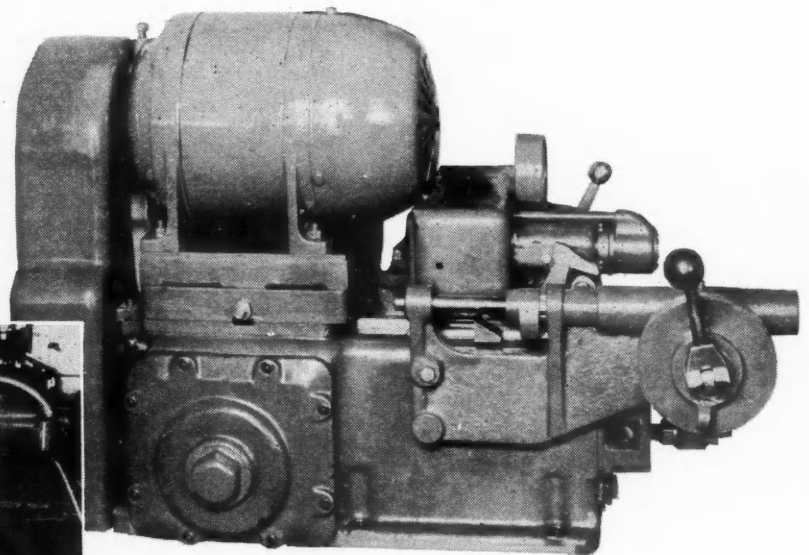


Fig. 2 (Right) Barnes SR-2 square ram hydraulic drilling unit

Car Acceleration Determined from the Engine and Chassis Specifications

By P. M. HELDT

IT is sometimes desirable to predetermine the acceleration of a proposed car from the horse power or torque curve of the engine with which it is to be equipped, and its general design characteristics, such as loaded weight, gear ratio, effective wheel diameter, and forwardly projected area. This can be done with a fair degree of accuracy almost entirely by a graphical method, which will be illustrated by an example.

It is assumed that a torque curve of the engine is available. If not, but a horse-power curve is available, the data for a torque curve can be readily calculated from the latter, for if the engine develops P horse-power at a speed of N revolutions per minute, then the corresponding engine torque is

$$T = 5250 (P/N) \text{ lb.-ft.}$$

Assuming the friction losses in the transmission mechanism to be proportional to the power transmitted, the propelling force developed at the tread of the driving wheels is directly proportional to the engine torque and can be represented by the same curve by merely changing the scale of ordinates.

The friction loss in direct drive should not exceed 10 per cent, but it is advisable to make an allowance of at least 15 per cent for the difference between what the torque curve shows and what is likely to be obtainable on the rear-wheel treads. One reason for this is that torque curves, if they err at all, are apt to err on the optimistic side. They are obtained from test engines which are usually carefully tuned, and the driver may not be able to obtain quite the same torque even if he presses the accelerator down all the way. To allow for the losses in the drive and for any slight deficiency of the car engine on the basis of its torque curve, we multiply the engine torque by 0.85. The product is again multiplied by the rear-axle gear ratio, to obtain the effective rear-wheel

torque, and the product thus obtained is divided by the effective rear-wheel radius in ft., the quotient being the available propelling force.

A typical engine torque curve is shown in the drawing herewith. We will assume that the car to which this engine is fitted has a rear-axle ratio of 4.4 and that the effective wheel radius is 14 in. = 1.177 ft. (6.50/16 tires). For any given engine torque T , the propelling effort on the rear wheels therefore is

$$F_a = \frac{0.85 \times 4.4 \times T}{1.177} = 3.2 T \text{ lb.}$$

Therefore, adjacent to the vertical scale of lb.-ft. for the engine torque, we draw an additional scale of pounds in the proportion of 3.2 lb. per lb.-ft., and on this scale, by the use of the engine-torque curve, we can read off the propelling force available on the rear wheels at different engine speeds.

The speeds will generally be given in m.p.h. and it is therefore necessary to draw in, below the r.p.m. scale, a vehicle-speed scale in m.p.h. The relation between the engine r.p.m. and the vehicle speed is given by the equation

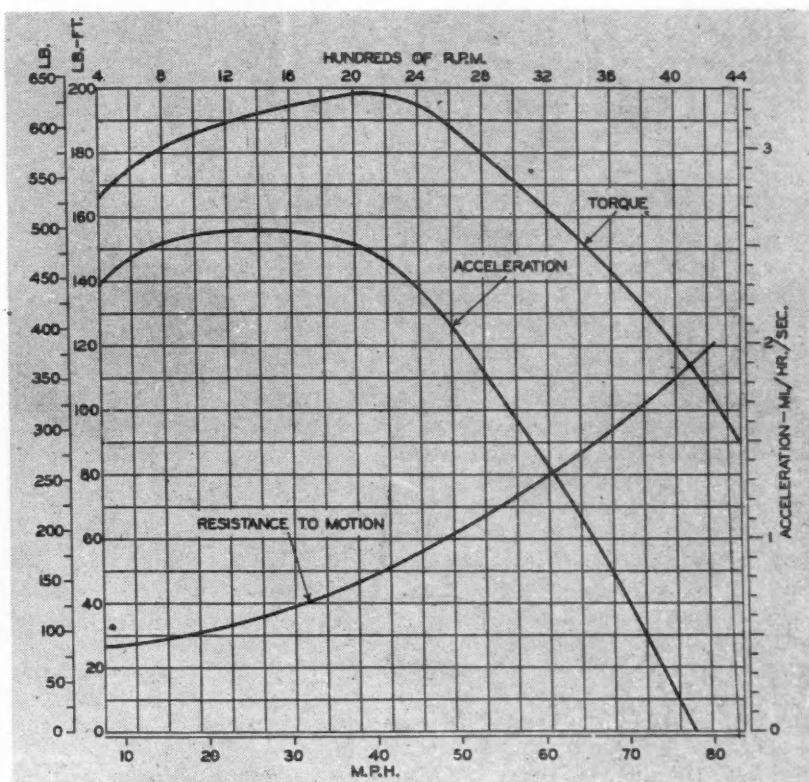
$$\text{m.p.h.} = \frac{\text{r.p.m.} \times D}{336 \times r}$$

where D is the effective wheel diameter in inches and r the rear axle ratio. In our case $D = 28$ and $r = 4.4$, hence the equation reduces to

$$\text{m.p.h.} = \frac{28}{336 \times 4.4} \text{ r.p.m.} = \frac{\text{r.p.m.}}{52.8}$$

Thus 10 m.p.h. on the bottom scale corresponds to 528 r.p.m. on the top scale.

It is next necessary to draw in a curve of the propelling effort actually



Torque, Resistance, and Acceleration Curves for car of 4100 Lb. Gross Weight.

required by the car at various speeds. We will assume that the car with supplies and crew weighs 4100 lb., that it has a forwardly projected area of 28 sq. ft., that its coefficient of air resistance is 0.0017, and the rolling-resistance coefficient, 20 lb. per 1000. This makes the rolling resistance 82 lb. at all speeds and the air resistance $0.0017 \times 28 \times V^2$, where V is the car speed in miles per hour. The total resistance to motion at any car speed V is therefore

$$R_t = 82 + 0.0017 \times 28 \times V^2$$

Values of R_t are plotted on the chart against car speed.

The difference between the available propelling force F_a and the total resistance to motion R_t , is the force available for acceleration, and this for any car speed is the difference between the ordinate of the "available force" curve and the "total resistance" curve for that speed. These differences are used as the ordinates for a third curve, the "accelerating-force" curve. The accelerating force or force available for acceleration can be read off directly on the scale of forces (lb.) on the left-hand side of the chart.

The accelerating-force curve can be used also as a curve of acceleration (maximum acceleration), as with a given mass to be accelerated the acceleration is directly proportional to the acceleration force. Force and acceleration are related by the equation

$$F = M a = \frac{W}{g} a,$$

hence

$$a = \frac{F g}{W}$$

In our case the value of W is 4100 lb. and g , of course, is equal to 32.17, hence the equation takes the form

$$a = \frac{g}{W} F = \frac{32.17}{4100} F = \frac{F}{127.4} \text{ ft. per sec. per sec.}$$

As 1 m.p.h. is equal to 1.466 ft. per sec., this is equal to

$$\frac{F}{1.466 \times 127.4} = \frac{F}{187} \text{ m.p.h. per sec.}$$

Therefore, by plotting a scale of m.p.h. per sec. along the right-hand side of the diagram, such that 1 m.p.h. per sec. is equal to 187 lb. on the force scale of the left-hand side, we can use the curve of accelerating force also as a curve of acceleration.

It will be seen that in this particular case the maximum acceleration of the cars is slightly over 2.5 m.p.h. per sec., and that the acceleration remains substantially constant from 10 to 40 m.p.h.

If it is desired to determine the time it takes to pass from a certain low to a certain higher speed, say from 10 to

40 m.p.h., the way to proceed is as follows: From the diagram it can be seen that the average acceleration over this speed range is very close to 2.5 m.p.h. per sec. As the speed increase is 30 m.p.h. the time required to gain this speed is

$$30/2.5 = 12 \text{ sec.}$$

If it is desired to determine the time required for accelerating through a speed range in which the acceleration varies considerably, it is best to determine from the chart the average accelerations for successive speed gains of 5 m.p.h. or 10 m.p.h. and then add the times so found. For instance, suppose it is desired to find the time required to speed up from 40 to 60 m.p.h. with the car to which the chart applies. It will be seen that the average acceleration between 40 and 50 m.p.h. is 2.25 m.p.h. per sec., and between 50 and 60 m.p.h., 1.80 m.p.h. per sec. The time required for passing from 40 to 50 m.p.h. therefore is

$$10/2.25 = 4.44 \text{ sec.}$$

and that required for passing from 50 to 60 m.p.h.,

$$10/1.8 = 5.55 \text{ sec.}$$

which makes the total time,

$$4.44 + 5.55 = 9.99 \text{ or practically } 10 \text{ sec.}$$

The time required to attain the maximum speed can also be determined in this way.

Producer Gas Vehicles

(Continued from page 56)

of tubes in a metal housing. Cooling air passes through the tubes and abstracts heat from the gases, which pass through the space between tubes. The gases then pass in succession through two filters of different type. The first is filled with metal shavings, and the gas passes through it upwardly, depositing impurities still held in suspension by it. The second is a cloth filter, which retains the finer dust. The deposits formed in these filters can be removed through suitable openings at the bottom, and this is usually effected automatically by means of aspirator A, which can be cut in or out of circuit by the change-over valve D. This is a three-way valve. It is set in the first position for starting the producer. The fire is kindled by means of the fan, and the gas, which begins to develop gradually, is allowed to escape to the atmosphere. With the valve in the second position the outlet to the

atmosphere is closed and the fan then forces the gas generated toward the engine. With the valve in the third, or running position, the electric fan draws the gas no longer from the generator directly but from the filters. It creates a rapid flow through the filters and causes the gas to be deprived of the solid impurities entrained by it.

The vacuum gage gives the driver a check on the operation of the filters. A high vacuum is indicated while the engine is running under full load, as in ascending grades, when the gage should be particularly watched. The filtering elements, of course, become clogged gradually, and the increase in the reading of the vacuum gage warns the driver when there is need to clean or renew the filtering elements. If the gage shows no vacuum at all it indicates that the filters are broken and need to be replaced.

Next the gas passes to the mixer,

where it is mixed with air in suitable proportion, and the mixture then passes on to the engine cylinders.

At the Summer Meeting of the S.A.E. Waukesha Motor Co. exhibited a crankcase for a proposed universal single-cylinder test engine for use in the development and study of aircraft engines. This test engine is being developed in collaboration with an informal advisory committee. It is proposed to develop an "engine" minus cylinder, piston, connecting rod, ignition equipment and carburetor, to which a single cylinder of any new or old multi-cylinder aircraft engine can be fitted for test purposes. The design of a crankcase for this purpose naturally involves numerous problems not encountered in the design of the regular engine, including problems of balancing, bearing loading, and lubrication.

New DEVELOPMENTS

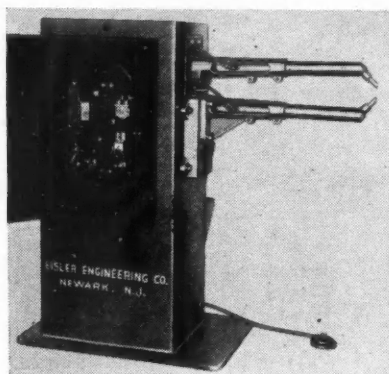
**Automotive Parts, Accessories
and Production Tools**

Spot Welder

Capable of making 100 spots per minute; machine equipped with 8-point hand wheel for heat regulation.

An air-operated spot welder, recently brought out by the Eisler Engineering Co., Inc., Newark, N. J., is capable of making up to 100 spots per min.

Arms shaped for welding different



Eisler air-operated spot welder

types of work can be substituted for the 36-in. arms installed on the machine illustrated; arms can be supplied from 36 in. to 48 in. long. A water cooling arrangement passes water through the arms, electrode holders, and electrodes.

Duration of the welding period is regulated by automatic timer and contactor, the timer being adjustable to regulate current from 2 to 60 cycles in 110 divisions. The machine is equipped with an 8-point hand wheel for heat regulation and has an air-cooled transformer.

Flow Meter

Simplifies procedure for making gasoline economy tests on automotive vehicles

A flow meter intended to simplify procedure for making gasoline economy tests on passenger cars and commercial vehicles has been placed on the market by the Houser Engineering and Mfg. Co., Bluffton, Ind.

The upper hose visible in the accompanying illustration of the meter is connected with the pump line. Fuel is forced under normal pumping pressure into the inner glass tube from which it

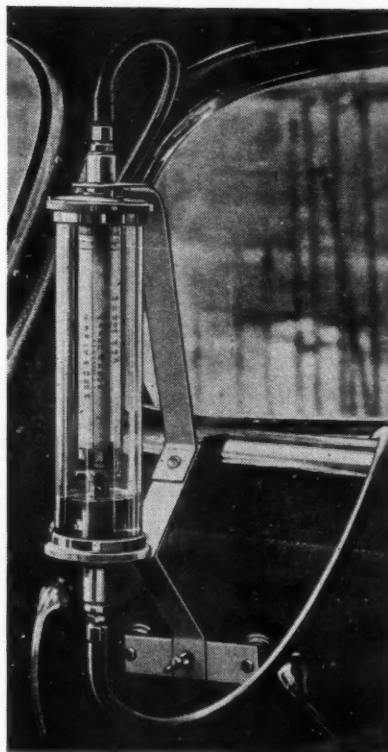
flows by gravity through a series of small holes into the large glass tube, and from there into the carburetor. The inner cylinder is calibrated in one column showing gasoline consumption for $\frac{1}{2}$ gal. to 10 gal. per hr., together with eight other columns representing speeds from 10 to 80 m.p.h.

Readings can be taken with the car in motion at various speeds. The only manual operation required is to turn the cylinder to the column representing road speed.

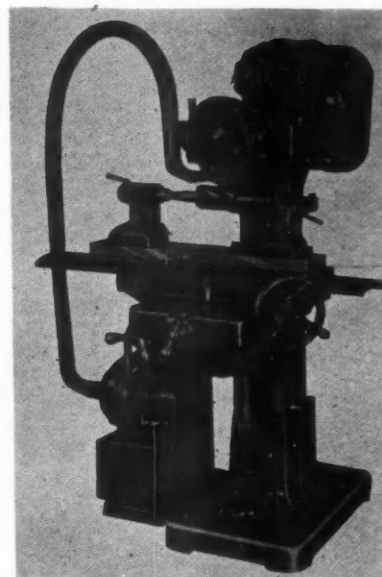
Surface Grinder

for grinding all kinds of milling cutters, counterbores, special tools and irregular surfaces.

A swivel head surface grinder with swivel table has recently been developed by the Covell Mfg. Co., Benton Harbor, Mich. The machine is equipped for grinding all kinds of milling cutters (including spirals), counterbores, spe-



Houser fuel flow meter



Covell swivel head surface grinder

cial tools and irregular surfaces.

Essential dimensions of the new grinder are: longitudinal travel of table, 18 in.; vertical movement of table, 11 in.; traverse movement of table, $7\frac{1}{2}$ in.; working surface of swivel table, 6 by $28\frac{3}{4}$ in. with $3\frac{1}{2}$ in. T-slots; table swivel, 45 deg. each way; work swing, $12\frac{1}{2}$ in. diam. by $14\frac{1}{2}$ in. long; head swivels, 30 deg. each way; distance from center of grinding wheel to table, max. $17\frac{1}{2}$ in., min. $6\frac{1}{2}$ in.; main spindle speeds, 1900 r.p.m., 2400 r.p.m., 2900 r.p.m.; size of standard grinding wheel 10 in. diam. by $\frac{3}{4}$ in. thick by $2\frac{1}{2}$ in. hole (other wheels up to $2\frac{1}{4}$ in. thick are special).

Grinding

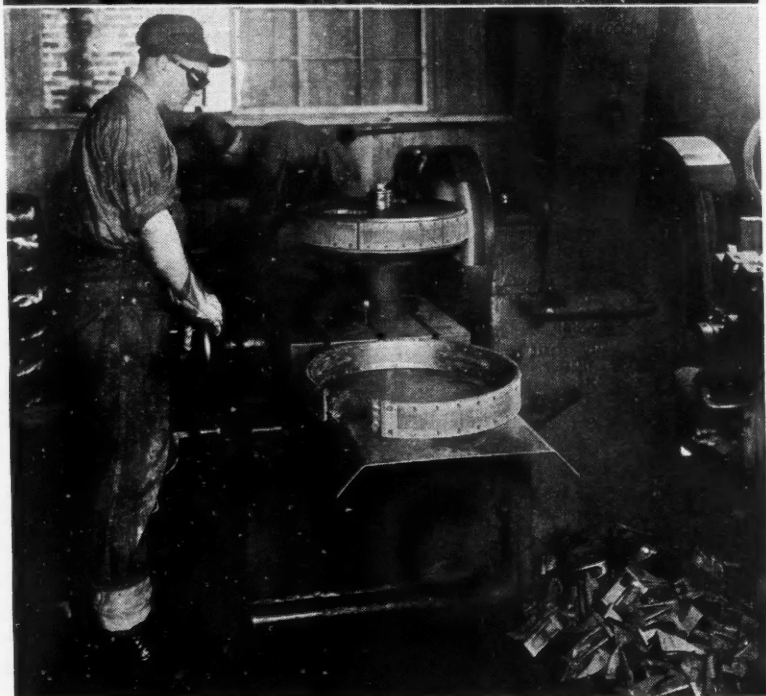
of cylindrical parts concentric with their axes done on automatic machine; nominal capacity 10-in. diameter, 18-in. length.

Norton Co., Worcester, Mass., recently brought out a new design of its 10-in. type C cylindrical grinding machine for plunge cut grinding operations.

The machine automatically grinds cylindrical parts concentric with their axes. Manual work consists of keeping the machine supplied with material, compensating for wheel wear by means of a standard mechanism adjustable to 0.0001 in., and truing the grinding wheel to maintain desired finish. The wheel truing mechanism is hydraulically operated and built into the wheel guard.

Automatic grinding cycle includes placing work in the holding and driving position, grinding to accurate size,

(Turn to page 66, please)



Remote Control

COINCIDENT with the growth of the coach trailer business, the Warner Electric Brake Mfg. Co., Beloit, Wis., has developed a standardized line of its electric power brakes for application specifically on coach trailers and on commercial trailers for heavy-duty hauling. A similar line of special heavy-duty equipment has been adopted by the U. S. Army service for gun carriages and other types of trailer operation. While the original principle of design and operation remains the same, the new line incorporates many refinements in detail and is supplemented by a complete system of controls which can be installed on any mo-

(Top) On the assembly line at Beloit, Wis., showing operators completing the final assembly stages of the Warner Electric Brake used on house trailers and heavy-duty trailers

(Center) The magnet shell of the Warner Electric Brake is accurately machined on this automatic lathe set-up before the coil is inserted. Note the double tool blocks—one for roughing, the other for finishing

(Lower) This special set-up on a Gardner face grinder is used to grind linings accurately to size after riveting on the shoes for the Warner Electric Brake

Cutaway view of the Warner electric brake

- A—Armature (disk)
- B—Electro magnet
- C—Brake band
- D—Cam lever
- E—Brake drum



brakes for coach and commercial trailers have reached the "production line" basis of manufacture at the Warner plant

tor vehicle. According to the manufacturer, the electric-power brake has many features of value on remote-control trailer-brake installations. The most important of these are ease of brake installation at the trailer factory; simplicity of installation of wiring and controls; and ability to control braking effort through simple electrical rheostats.

The illustration shows the brake which, in its present form, has been modified by improvements in magnet design so as to produce a much lower range of unit pressures on the face of magnet and armature. So far as design goes, the brake for coach trailers and for heavy-duty commercial jobs is identical. Actually the heavy-duty brake is pictured but this differs from the house trailer unit only in size and more particularly, in the design of the cam lever. For the latter, a single cam plate is used instead of the toggle levers shown on the heavy-duty unit.

For all types of trailer installation, the manufacturer recommends the use of the new controller which is, in reality, a special form of rheostat for pro-

portioning the flow of current to the brake in accordance with the movement of the hand lever. The controller is preferably mounted on the steering column for hand rather than foot operation so as to give the operator complete control of trailer braking at his finger tips. This is said to be the most desirable set-up, since the trailer braking system should come into play ahead of the tractor or towing car brakes. Moreover, the controller may be used to operate the trailer brakes to assist in steering while on the road and at speed.

For heavy-duty work, Warner recommends the installation of three different control units, each designed for a specific duty. The controller, of course, is the primary element used for brake application. This may be supplemented with a load control which is set at will by the operator to take care of varying load conditions. For example, the full-load setting of the dial will supply the maximum current to the controller. However, when traveling light or without load on a return trip, the operator can set the dial to the light-load position to decrease current flow and, consequently, the amount of braking effort produced by the electromagnet.

The third control element is an automatic safety switch which may be hooked up in various ways at the trailer to serve as an emergency break-away device. With this arrangement, if the trailer is provided with an auxiliary dry-cell battery, the safety switch will

automatically set the brakes whenever the trailer is uncoupled designedly or accidentally. The operator can release the brakes at will, after the switch has set them, by moving the switch lever to the "off" position.

The most economical installation of the electric brake for any service is made at the vehicle factory on axle mountings suitable for the purpose. However, the connections on the towing car or tractor can be made in the field in a very short time. This is of particular value on heavy-duty installations where the trailer and tractor units are purchased from different sources.

An important feature of the electric-power brake is said to be the fact that it is self-equalizing for lining wear and requires no mechanical adjustment to take up wear or increased clearance due to any cause. When wear occurs, the electro-magnet simply moves through a somewhat greater arc or displacement to produce the braking effort. And this action will continue progressively until the electro-magnet comes up against an internal stop, preventing further displacement when the lining has worn down to the rivets.

The house trailer brake is made in one standard size, 12 x 1 3/4 in. while the heavy-duty brakes are made in a range of sizes depending upon the gross vehicle weight. For this service, Warner supplies a 16 x 2 1/2 in. set; and a 17 1/4 in. set in widths of 3, 4, 5, and 6 in.

New Developments

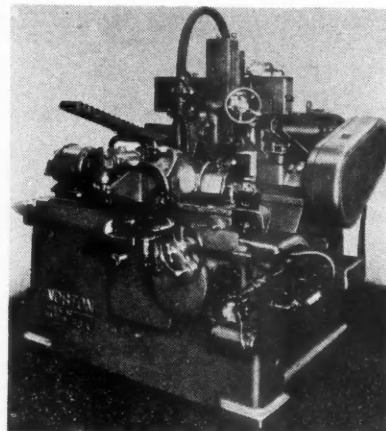
(Continued from page 63)

releasing the finished piece and dropping it into a return chute. Regulation of the time required for the automatic cycle is by means of a hydraulic valve which may be adjusted at any time during the operation of the machine.

Headstock, footstock and work loading fixtures vary according to shape and size of work and grinding requirements. A chute type loading fixture, arranged for grinding steel bushings

internally splined, can be seen on the machine illustrated. Hydraulically operated fingers at the bottom of the chute pick off one bushing to be ground, advance it between centers of two live spindle synchronized work heads while simultaneously removing previously ground bushing and dropping it into the return chute.

Nominal capacity of the machine is 10 in. diameter and 18 in. length. Ac-

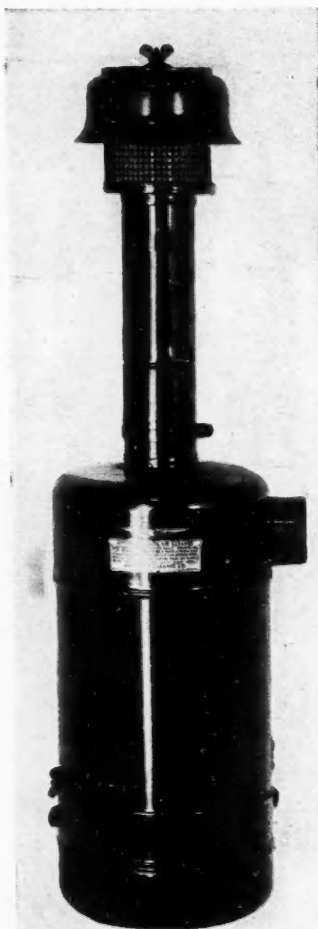


Norton 10-in. cylindrical grinding machine for plunge cut grinding operations.

tual capacity, however, is determined by the work and design of the work heads and loading mechanism.

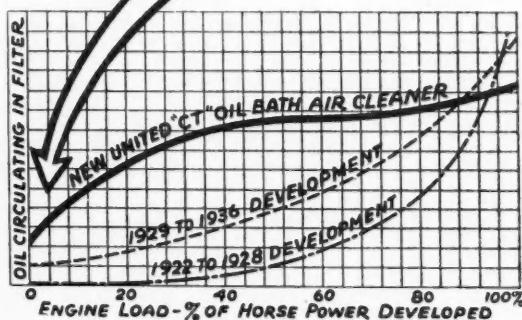
A grinding wheel 24 in. diameter and up to 5 in. wide or 20 in. diameter up to 7 in. wide is employed.

ANOTHER UNITED IMPROVEMENT



"CT" oil bath air cleaner for use on tractor and industrial type engines.

Even at Low Idling Speeds Air Stream Produces High Oil Wash



THE NEW UNITED "CT" OIL BATH AIR CLEANER offers outstanding protection at both low idling speeds and light engine loads as well as at normal engine loads. It reduces oil "pull over" danger to minimum at maximum engine loads. The same relative high cleaning efficiency is retained at all throttle openings.

Better engine protection is our constant aim.



UNITED AIR CLEANER CO.

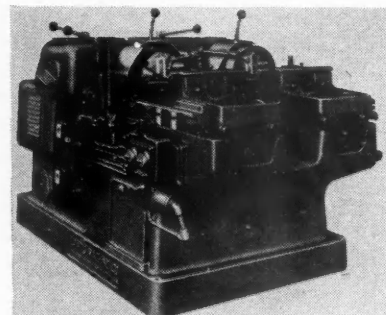
9705 Cottage Grove Avenue
Chicago, Illinois

Steering Gear Shafts

turned on hydraulically operated double spindle machine with special work-centering device.

The Landis Machine Co., Waynesboro, Pa., recently designed a hydraulically operated double spindle machine for turning steering gear shafts and similar parts to prepare them for final grinding operation. The machine, called the Lanhydro, has a special centering device for supporting work. It consists of a female center backed up by a long spiral spring to keep pressure against the work constant. The center travels back through the spindle with advancement of the carriage.

A rapid feed is provided to carry work to the turning head. Coarse turning feed is used throughout the machining operation to a point within 0.008 in. to 0.010 in. of the shoulder. Where a shoulder must be faced, a fine finishing feed is used. Length of travel



Landis hydraulically operated double spindle machine for turning steering gear shafts.

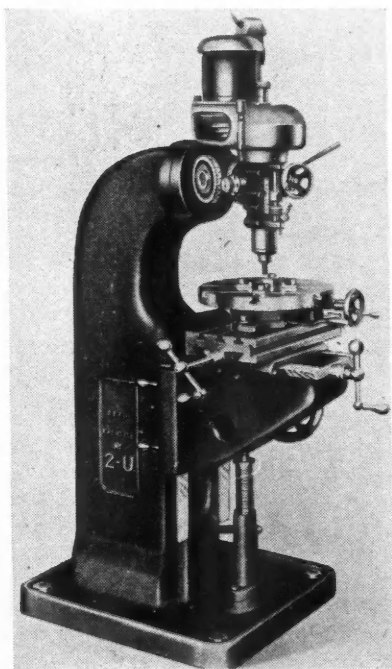
of the finishing feed is adjustable for any material or condition.

The carriage advances under a finishing feed to a definite stop. A variable "dwell" time is then provided for final clean up and to make possible holding of extremely close limits in length from end of shaft to face of shoulder. After the "dwell" period, the turning head opens under hydraulic pressure and the carriage is rapidly returned to complete the cycle. The turning head automatically closes as the carriage returns.

Milling Machines

of standard and dual control types with spindle speed range 30 to 1200 r.p.m.

The Brown & Sharpe Mfg. Co., Providence, R. I., recently brought out several milling machines of new design. They are available in two models: a standard type, for ordinary manufacturing and toolroom work; and a dual control type, for work requiring wide feed range and complete control from both front and rear operating positions. Both styles are high-speed machines, with 16 spindle speeds ranging from 30 to 1200 r.p.m.

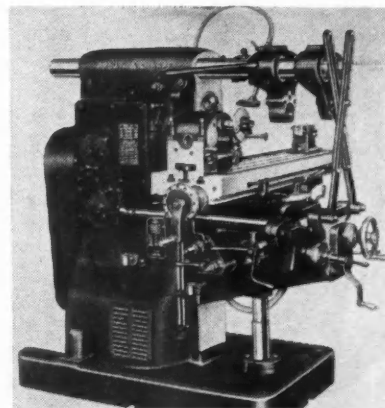


Milling machine for general tool and die work which was recently brought out by the Reed-Prentice Corp., Worcester, Mass. Some essential dimensions are: longitudinal feed, 16 in.; cross feed, 11 in.; vertical feed of knee, 15 in.; working surface of table, 20 1/4 in. by 8 3/8 in.; length of carriage, 16.5 in.; rotary table, diameter of working surface, 15 in.

Brown & Sharpe Milling machine of new design.

Dual control type machines have 32 rates of feed, from 9/32 in. to 40 1/4 in. per min. longitudinally and 1/8 in. to 16 1/4 in. per min. for transverse and vertical feeds.

Standard models have 16 feed rates, 11/16 in. to 26 in. per min. longitudinal and 9/32 in. to 10 3/8 in. per min. transverse and vertical. A wide feed range mechanism, giving 32 feed rates of the same range available on dual control



Spicer started with the automotive industry, and has grown with the industry. In several instances, our relationships with manufacturers of passenger cars and commercial vehicles have been maintained continuously for more than thirty years.

Spicer Universal Joints, Brown-Lipe Transmissions, Parish Frames, Salisbury Axles—each name is the oldest in its field.

Yet age alone is not enough to keep a company in the forefront of the automotive industry. Besides the stability of years, there must also be constant progress to keep abreast of the changes and advances in automotive design and engineering. That **Spicer** is not only long established but also has kept pace with these advances, is, we feel, just cause for pride.

Spicer is truly an old name—and a progressive name—in a great industry.



Spicer Manufacturing Corporation Toledo • Ohio

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CLUTCHES and
TRANSMISSIONS

SALISBURY
FRONT and REAR
AXLES

SPICER
UNIVERSAL
JOINTS

PARISH
FRAMES
READING, PA.

types, can be supplied as an extra on the standard type machines.

Other characteristics of these machines are listed by the manufacturer as: fast travel for all movements, 140 in. per min. longitudinal and 56 in. per min. transverse and vertical; safety hand-crank for longitudinal adjustments of the table; automatic lubrication of knee and column mechanisms; rotating speed and feed rate selective levers; and two-position control of feed engagement, of the direction of all feeds, and of the starting and stopping of the machine.

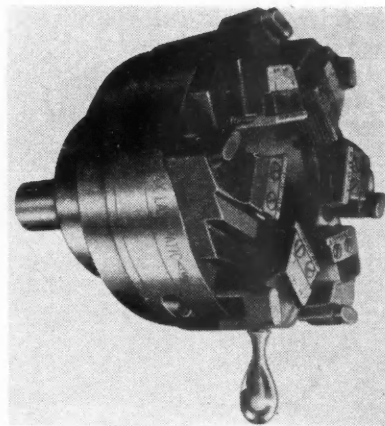
Die Head

for threading large diameters, long thread lengths—added to Landis line

A die head for threading large diameters, long thread lengths, has been added to the line of threading equipment manufactured by the Landis Machine Co., Waynesboro, Pa.

Diametrical capacity of the head is 4 in. to 5½ in. with pitch range 7 to 20 threads per inch. The head illustrated here has a capacity of 7 in. thread length on 5½ in. diameter.

The new unit is a self-opening, pull-



Landis die head for application to turret lathes and hand screw machines

TIME FOR THE NEW CARS!

Timing the new model announcements is being given a lot of careful consideration these days. Motor "timing" has long since been taken care of . . . with Morse Silent Timing Chains. In twenty-five

years, no other form of cam-shaft drive has been found so quiet, dependable and efficient. From Morse drafting boards each year come the newest developments in timing drive design.

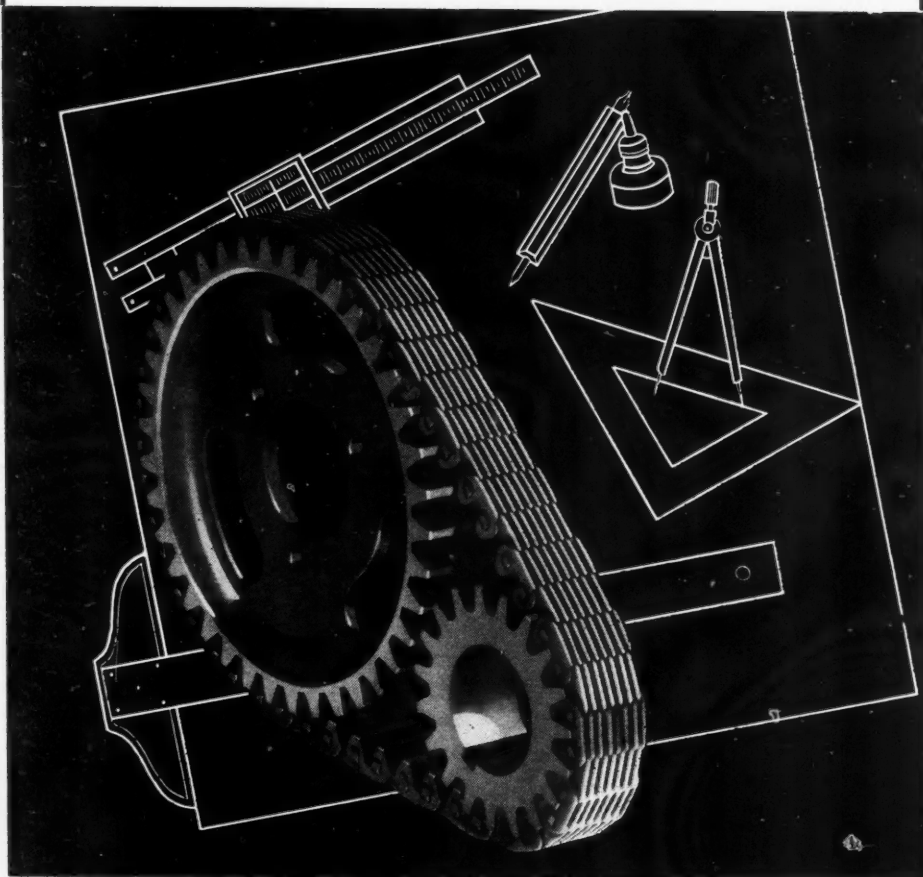
MORSE CHAIN COMPANY

Detroit, Michigan Ithaca, N. Y.

Division of Borg-Warner Corporation

MORSE

SILENT TIMING CHAINS



off type for application to turret lathes, and to hand screw machines. It is heat treated throughout and ground for maximum wearing qualities. Diametrical graduations on the circumferential surface and micrometer graduations on the adjusting screws are said to insure rapid and accurate size changes.

By using 6 chasers instead of 4, cutting load is more widely distributed. According to the manufacturer, advantages provided by the new head are: increase in tool life, with more threads obtained per grind of the chaser, improved quality of product being threaded, and also an increase in life of the die head.

Electric Fuel Pump

adaptable to multiple hook-up on truck or industrial installations

A new electric fuel pump has been announced by the Autopulse Corp., Detroit. It is recommended for original equipment and for installation by fleet operators on trucks and buses.

Best location for the Autopulse unit is away from the hot engine and underhood atmosphere, preferably near the gas tank and at a level below the carburetor. When so mounted, the pump will feed a uniform flow of fuel to the carburetor—without surge or forcing since the pressure is uniform and in no way dependent upon engine speed.

It is claimed that installation of this pump at the fuel tank eliminates vapor lock due to the fact that the temperature of the fuel at the carburetor is reduced from 60 to 70 deg. Fahr. Another advantage of the Autopulse is that it is adaptable to a multiple hook-up of two or more pumps for truck or industrial installation. Failure of one pump does not affect the others and the vehicle can continue without interruption.

It's the Motorist Who Pays the Bill

(Continued from page 52)

\$500,000,000 while the state highway departments have to meet only about \$68,000,000. Once a railroad bonds a mile of its road bed it seldom is known to pay off the debt even when it comes due it is merely refunded. On the other hand, states either call a certain amount each year or create a sinking fund for the purpose of buying them back. Another thing railroad propagandists forget and that is that states are generally paying as they go for their construction out of gasoline and other motor vehicle taxes.

The mileage of the hard surfaced state highway system of the United States in the aggregate (279,807 miles)¹¹ about equals that of the railroads' main track mileage (280,553).¹² The taxes paid by the highway users amount to \$3,620¹³ for each mile of state highway. On the other hand, the taxes paid by the railroads amount to approximately \$1,000² per mile of main track.

A "main track mile" has definite significance and means that if, as an illustration, you had a two (double) track railroad running from New York to Albany, a distance of 150 miles, there would be 300 main track miles. However, if there was a single (one) track line between those localities there would be only 150 main track miles, and that would be also the miles of road operated. Now there is another classification "all track miles," which means that regardless of where they are or for what purpose used, whether main tracks or side tracks, they are all added together. These three classifications in 1935 were 238,555 miles of road operated, comprising 280,553 main track miles and 402,431 all track miles.

The total cost of maintaining all of the railroads' roadway and structures, frequently referred to in this discussion, plus taxes paid when divided by the "miles of road operated" equals \$2,531 per mile, when divided by all "main track miles" gives \$2,155 per mile, and when divided by the "all-track mileage" gives \$1,503 per mile.

It is recognized that the cost of maintaining the railroads' roadway and structures contains many items of cost, the counterpart of which are not in any sense found on public highways, such as the cost of maintaining round houses, signals and interlockers, telegraph and telephone lines, and innumerable other items; and to the extent that such costs are included they tend to make the

comparison with the per mile cost of maintaining highways more favorable to the railroads. If they were all eliminated it would show that the highway users are carrying a still greater burden of taxation in contrast with railroads than is indicated by the foregoing figures.

Of course, the American system of motor vehicle taxation contemplates that the heavier and more expensive

equipment pays a greater proportion of the taxes than the cheaper and lighter vehicles, therefore, buses and trucks, both privately owned and operated as well as those in the for hire transportation business, pay their own way and their burden is not carried by either the railroads or the light private car user. So we come to the conclusion that highway users, competitors of railroads, contributed taxes to the maintenance, construction, road bed use, and for other road purposes aggregating at least 3% times that paid by railroads on the basis of the same yard stick. And that when the relative tax burdens of



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FACILITIES ✓
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ON THE TRUCK AND ON THE AUTOMOBILE

For nearly a quarter -- century we have been accumulating the plant and personnel which enables us to serve you economically and advantageously.

Your requirements of Pressed Metal Products will receive experienced attention and will be accurately and promptly produced. Send us your inquiries.

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¹¹ Latest data, U. S. Bureau of Public Roads.

¹² Data from Interstate Commerce Commission Statistics.

¹³ Data from Census Bureau.

these two competitors are compared on a per-hundred-dollar-value basis the comparison is as 25 is to 1 against the pocket book of motor-vehicle owners.

If anyone asks whether the highway users pay their proper share of taxes, the answer is that they pay many times more than their share. They pay proportionately more than any other class of tax payers do; and as long as the money is used to make better, safer and more convenient highways, there is no complaint. But when, as is the growing tendency, it is proposed to use motor ve-

hicle taxes to relieve the lighter burden on other classes of tax payers motor vehicle owners may be heard to cry out in unison, and with such a cry that the familiar bull ape call of Tarzan will sound like the muffled musical chirp of a cricket.

Characteristics of Injection System

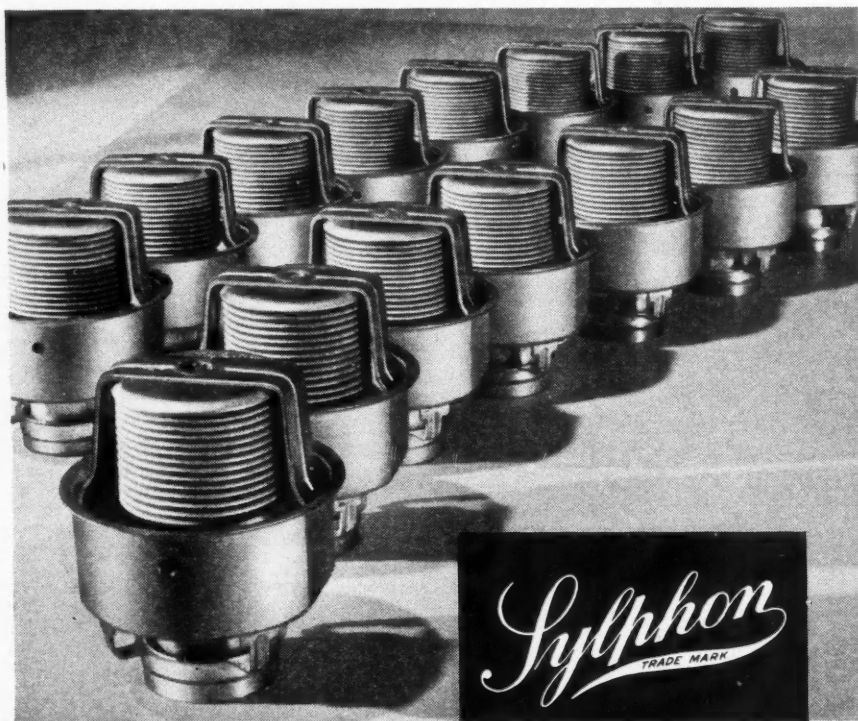
IN aircraft Diesel engines injection is sometimes effected by means of a number of injection valves in the same

cylinder connected to the same pump cylinder. If both injection valves are of identical design and connected to the pump by tubes of the same diameter, wall thickness and length, both valves should give identical discharge diagrams and discharge the same amount of fuel per cycle. However, as the pump is usually located on one side of the engine and the injection valves are preferably distributed around the cylinder (in the event of direct injection) it is difficult to make the lengths of the tubes to all of the injectors equal. If the lengths of the tubes to the two or more injectors are unequal, it can hardly be expected that injection from all will start at the same time and that all will discharge equal quantities of fuel per cycle. An investigation on the effects of the use of tubes of unequal lengths for two similar injection nozzles connected to the same pump cylinder has been made for the N.A.C.A. and the results are reported in Technical Note No. 600, "Discharge Characteristics of a Double Injection-Valve, Single-Pump Injection System" by Dana W. Lee and E. T. Marsh.

Tubes of Unequal Length

When the opening pressure of one injection valve was lowered while that of the other remained the same, the injection timing for the first valve was advanced while the timing of the other valve was retarded and its delivery reduced, and the amount of fuel injected through it increased, the time of spray stop remained practically unchanged. Occasionally a preliminary discharge from the injector with the higher opening pressure occurred ahead of the main discharge. Apparently, when the valve with high opening pressure was opened by a pressure wave from the pump, the much greater rate of flow already taking place through the other valve postponed the building up of the static pressure.

The quantities of fuel discharged by the two valves when using nozzles having different orifice areas were found to be proportional to the orifice areas only when all other conditions were the same for both valves and when the orifice areas were small compared to the flow area between the valve stem and seat. By a proper selection of orifice areas and valve-opening pressures, it was found possible to obtain a great many combinations of discharge quantities, discharge rates, and injection timings for the two valves. The timing of the sprays and the fuel quantity discharged varied widely and erratically with changes in the pump speed whenever tubes of unequal lengths were used between the valves and the pump.



The STANDARD Thermostat

• the tireless robot •

300,000,000 flexings without a sign of fatigue. Such tests have proved the high quality and uniform dependability of the Sylphon Bellows—heart of Sylphon, the Standard Thermostat. Made by the originators of this seamless, metal diaphragm, Sylphon Automotive Thermostats have the accumulated benefits of thirty-five years of research and experience. Today, these tireless and efficient performers are contributing toward increased motor efficiency and fuel economy in leading motor cars.

FULTON SYLPHON COMPANY, KNOXVILLE, TENN.